FOUNDRY

JUNE 1956
A PENTON PUBLICATION

INDUSTRIAL ENGINEERING

METALLOGRAPHY

BRASS SHOP COURSE

PATTERNMAKING

HEAT TRANSFER

STEEL CASTINGS

NOISE CONTROL

LIGHT METALS

EDUCATION

MALLEABLE IRON

GRAY IRON

PLANT EQUIPMENT

SAND SHOP COURSE

SAFETY and HYGIENE

GRAY IRON SHOP COURSE

CORE and MOLDING SAND

MALLEABLE SHOP COURSE

BRASS and BRONZE

REFRACTORIES

AFS CONGRESS
Technical Reports
Foundry Show

- **ZIRCONIUM IN CAST IRON**—Small additions of the alloy can influence many of the casting's properties
- **PEARLITIC MALLEABLE**—Adequate technical talent and proper equipment are requisites in casting it
- **AUTOMOTIVE TURBINES**—What is needed in foundry skills and new alloys to fill requirements for castings

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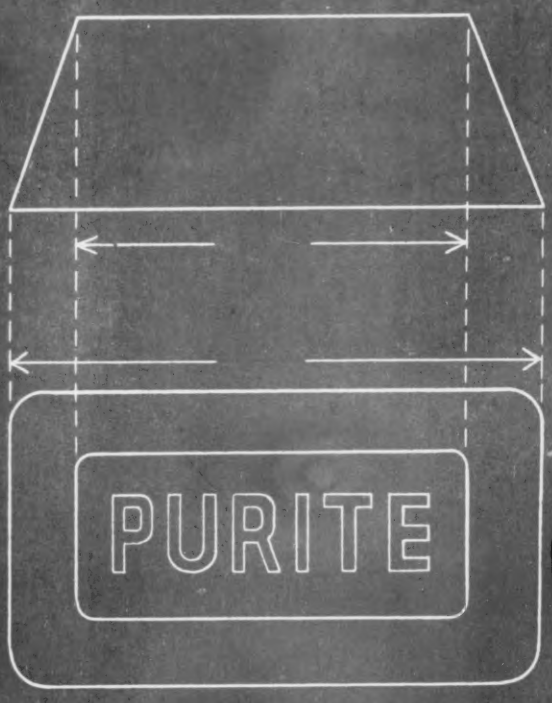

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PURITE produces higher percentages of acceptable finished castings—fewer rejects per ton of metal poured.

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PURITE comes in uniform 2-lb. pigs—no weighing or measuring required.

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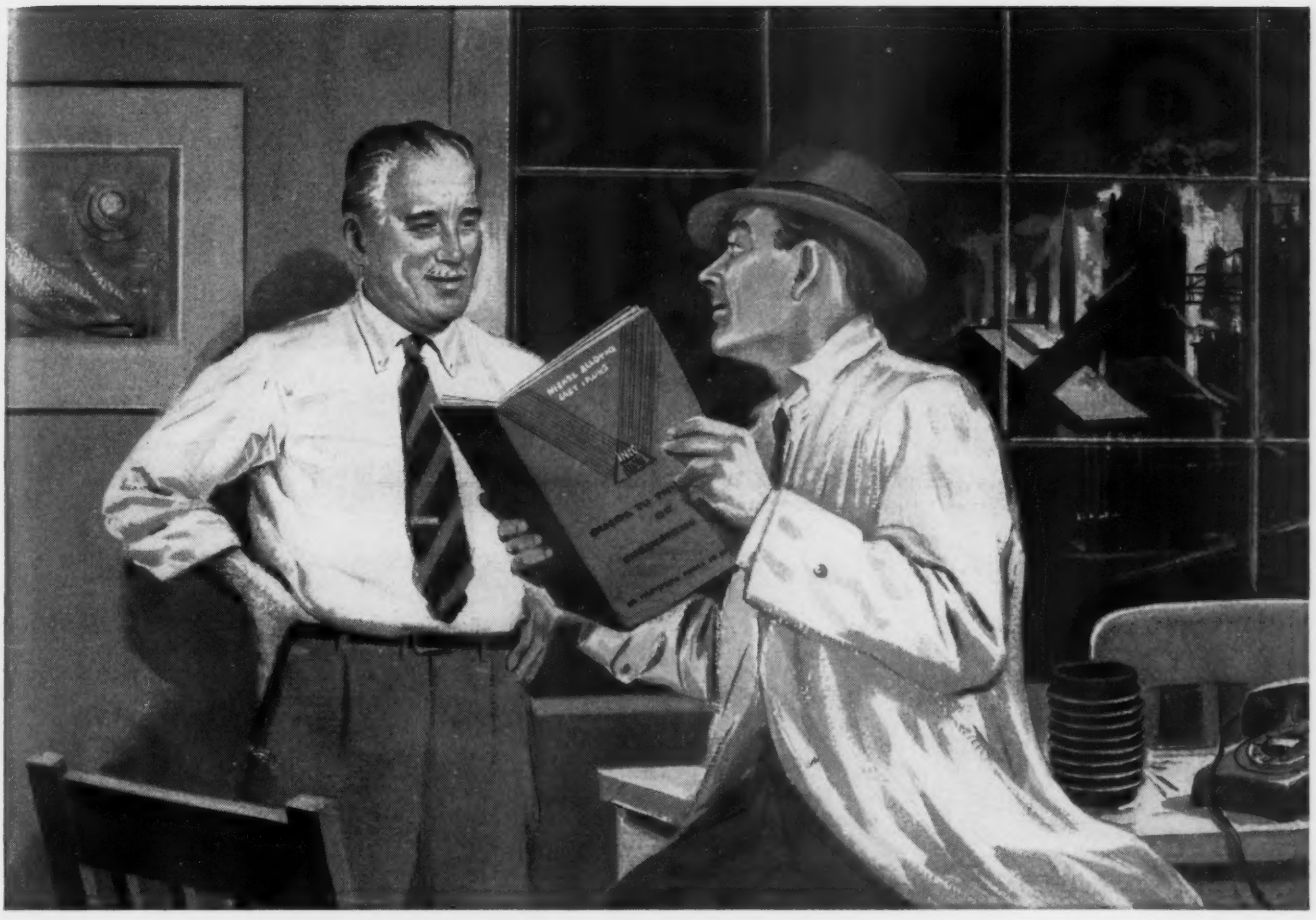


The hitch was in the mix

. . . or how Chuck Wright cured faults of thick and thin

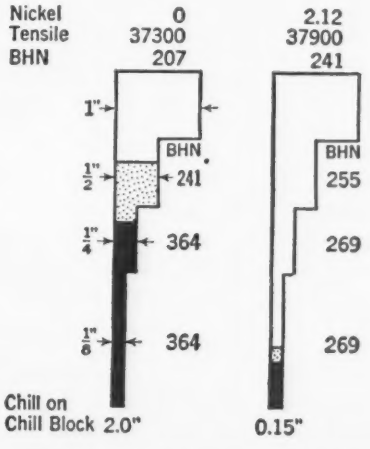
"Abbott Foundry got an order for air-cooled compressor cylinders that kept the place humming. But not the way you think," declared Chuck.

"The customer, of course, figured on high speeds and heavy cuts. Quick passage through the machine shop. After all," added Chuck, "you fellows know that *machinability* is one of the chief reasons why iron is so popular for production castings.

"But," continued Chuck, "a compressor cylinder needs something more. It must be *tight*. Especially where heavy and light sections join. Abbott's weren't. Quite a few came back.

"Wasn't a thing wrong with Abbott's practice. The hitch was in the mix. It had too much carbon and silicon to assure density, but Lex Snell, the mainstay at this foundry, was really worried ...afraid to reduce them because he feared chill in light sections that called for machining.

"From my briefcase, I pulled out a binder of charts to show Lex some step-bar tests. Like this:



"On his desk was a leaker. Pointing to where it needed machinability, and then to where it needed tight iron, I said, 'Lex, whatever these sections, lower your carbon and silicon. Add 1.25%-1.50% nickel to get rid of chill, and you'll have iron that's tight as a drum, and machinable throughout.'

"Lex asked, 'How can you machine the casting if it's so tight?'

"Here's the answer: structure . . . not just hardness . . . determines machinability. And structure also determines pressure tightness.

"This tip paid off for Lex just as it has for others. So when *you* are up against a problem involving the metallurgy of castings . . . call me over. I may have a tip for you. Best way to reach me is through INCO."

Chuck Wright

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Nickel Company, Inc.

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HIGH DRY BOND STRENGTH
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AVAILABLE IN PULVERIZED, GRANULAR AND SLURRY GRADES

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FOUNDRY
A PENTON PUBLICATION

June 1956

Volume 84—Number 6

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(For addresses of branch offices, see page 325)

BRUTE

The Prescott Company pours 32 tons of metal to make one casting for a skin mill bed plate. Using four ladles, it takes four minutes to pour one casting.

CASTING

CONSUMES 126 GALLONS OF

LINOIL

Long before a skin mill starts turning out airplane wings, production problems arise. For instance, making the intricate, 30-ton castings for the mill bed plate was a problem until The Prescott Company took over. Combining expert craftsmanship with the finest of materials, Prescott did the job.

All told, they poured 32 tons of metal for each casting . . . only two tons of metal for risers, gates and sprues. The core mix included 37 tons of core sand and 126 gallons of LINOIL per casting. Dependable LINOIL is used at Prescott Company. That's because it is always uniform. LINOIL also provides the workability and thorough baking qualities these castings demand.

Your LINOIL man has more than 50 grades of LINOIL to help you produce superior castings. And he's backed by the largest technical service organization in the core binder business. Why not call him today?

CASTING STATISTICS

Foundry	**The Prescott Company, Menominee, Mich.**
Size of casting	22 feet long, 8 feet wide, 3 feet high
Number of cores	64
Average weight per core	1,200 lbs.
Weight of casting	30 tons
LINOIL used	about 126 gallons
Core sand used	37 tons
Pouring time	4 minutes using 4 ladles
Metal	Meehanite, Type GC; 45,000 lbs. tensile strength; 200 Brinell hardness

Archer • Daniels • Midland company

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LINOIL • INDUCTOL • LIN-O-CEL • FREFLO • ADMIREZ

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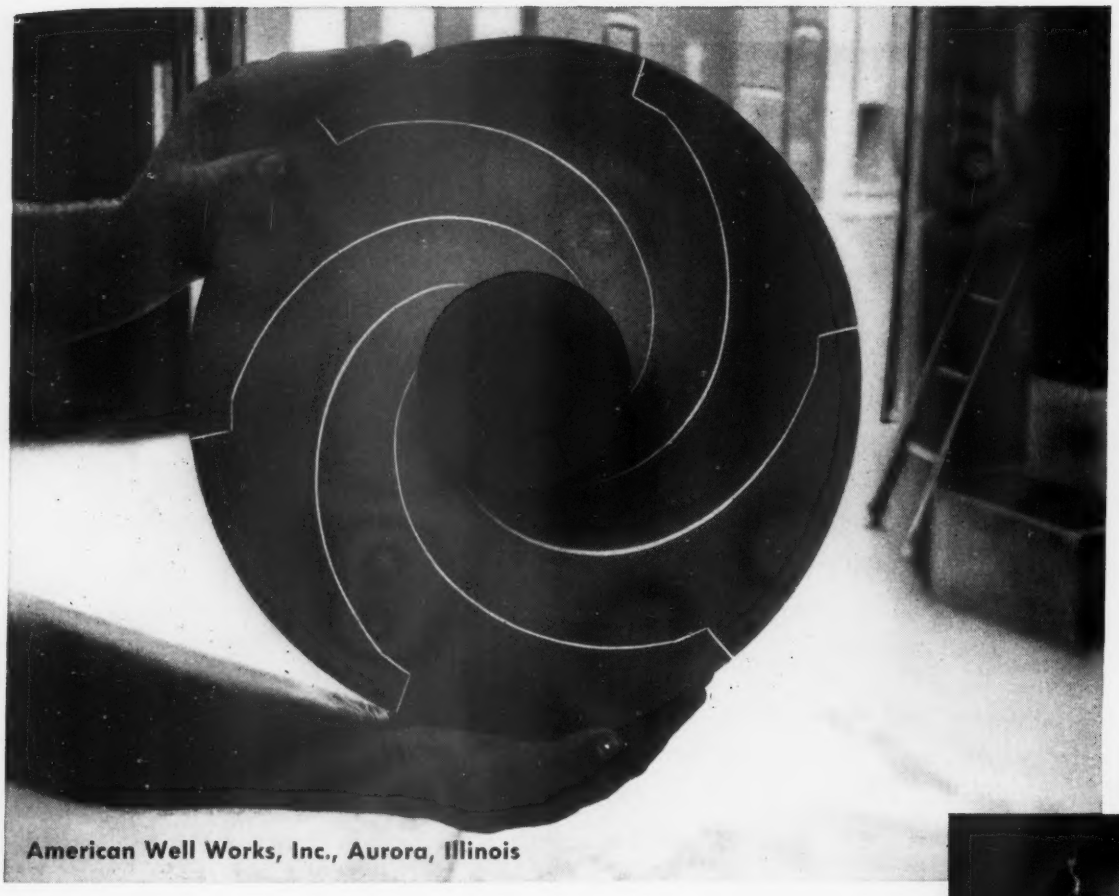


American Well Works, Inc., Aurora, Illinois

"IF IT'S NOT PERFECT, IT MUST BE THROWN OUT!"

Why American Well Works uses Cities Service Delco Core Oil

Mister, you're looking at one of the most complicated cores made—and at American Well Works, it must be perfect or get thrown out.

American has an 86-year reputation to maintain—a reputation for custom-engineered deep well turbine pumps and other equipment for handling water and waste.

For this reason, American carries the making of parts from raw material to finished product. Naturally, that means its own foundries . . . one for iron, another for brass. In each case, however, the brand of core oil is always the same—Cities Service Delco Core Oil.

At the iron foundry, Delco #936 has won high praise for its adaptability to all sized cores, without alteration of the mixture. "It's uniform from batch to batch, has reduced blows to a minimum, and allows us to use one quart of oil for every three required by our previous brand," reports American.

The story is similar in the brass works where Delco #54 is used to make intricate cores for pump castings. "Core and core oil must be perfect," says American, "and we're happy to say they almost always are."

To find out more about Delco Core Oils and results of firms such as American, talk with a Cities Service Representative. Or write: Cities Service Oil Company, 20 North Wacker Drive, Chicago 6, Illinois.

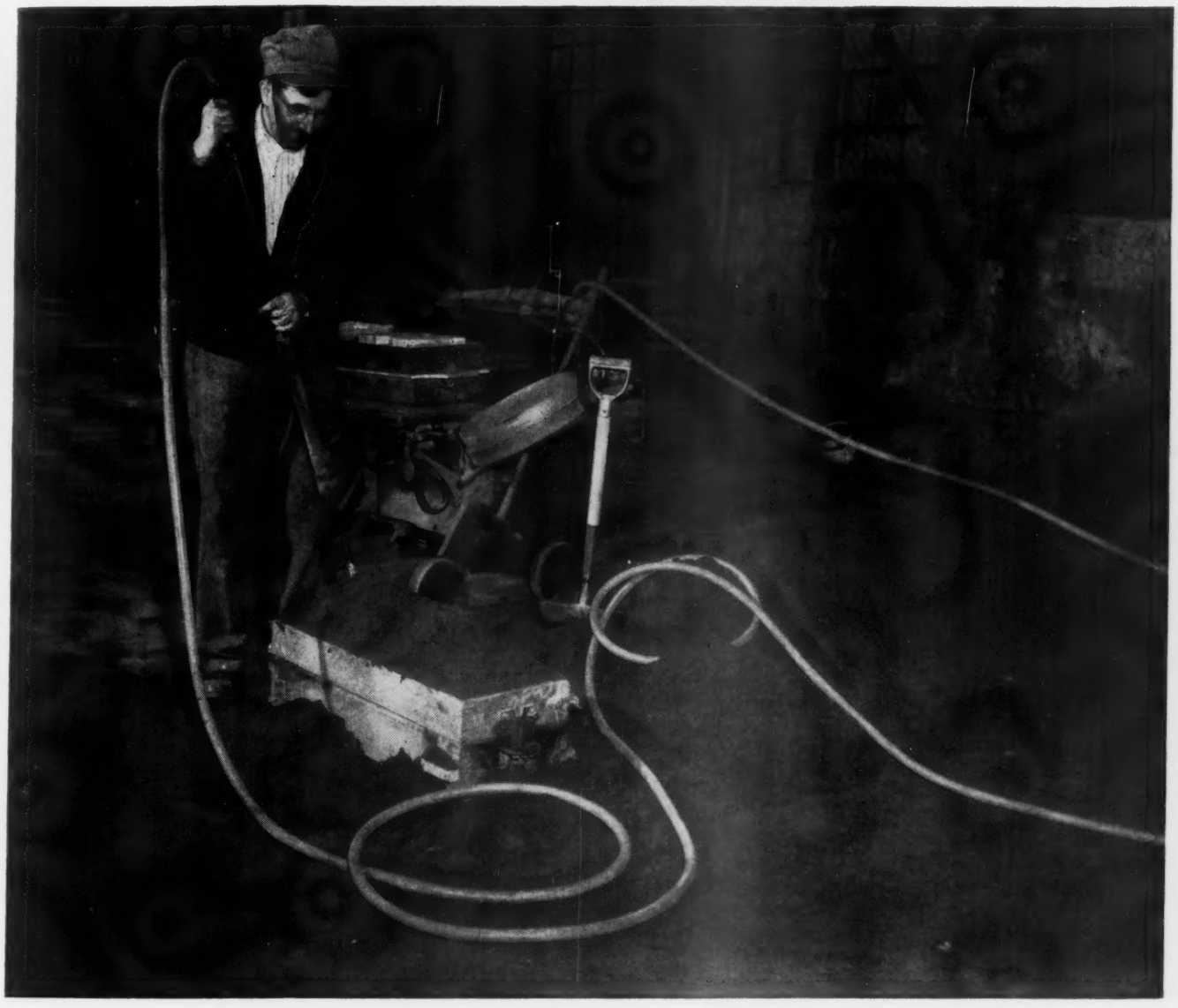
CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Pouring A Casting, American's employees put the core and its core oil to the acid test. Thanks to Cities Service Delco Core Oils, blows have been reduced to a minimum in both the brass and iron foundries.

Many Sized Cores are produced by American Well Works' iron foundry—yet one oil, Cities Service Delco #936, is suited to them all, without alteration of mixture. They now use only 1 qt. of Delco #936 for every 3 required by their previous oil.

B.F.Goodrich



Hose lasts for years in heat, oil, hard knocks

B. F. Goodrich Type 50 handles 85% of all air hose jobs

IN foundry service, the hose on small air tampers used to last only a few months. Sometimes the hose would be crushed by falling materials. Or the hot air would harden the rubber, causing it to crack.

B. F. Goodrich engineers went to work on the problem, and came up with improvements in air hose, using new rubber compounds for both tube and cover. This improved B. F. Goodrich hose was in its fifth year service when the picture shown here was taken, still good for many more years.

Rough treatment won't tear it

In foundry service, air hose is often dragged over rough, gritty surfaces. So B. F. Goodrich makes Type 50 hose with a tough, non-peeling oilproof cover. It stands rough treatment and has high resistance to tearing, cutting, gouging and abrasion.

Heat won't crack it

Special rubber lining in Type 50 air hose withstands hot air, won't harden and crack, nor will it break into loose, gummy particles to clog tools.

Before you buy another length of air hose, check first with your B. F. Goodrich distributor. Chances are Type 50 will be the right hose for your job because it handles 85% of all air hose needs. *The B. F. Goodrich Company, Dept. M-594, Akron 18, Ohio.*

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Core Storage Doubled using ELPAR Trucks

THE PROBLEM:

Increased production plus a serious shortage of core storage space created a major problem for a prominent eastern foundry. They use a wide variety of cores and each type must be kept separated and quickly available.

THE SOLUTION:

Company engineers devised a rack handling system to be used with ELPAR high lift platform trucks. Racks 90″ long were made in one, two, and three shelf units for different cores. Racks have legs to permit entrance of trucks' platform. Also, stationary supports were installed in core room to permit double tiering racks. Supports were built at 45° angle to travel aisle. ELPAR trucks are 6000 lb. gas-electric units with telescoping uprights.

BENEFITS:

Twice as many cores can now be kept in same area due to high stacking. Angle storing saves floor space and provides wider travel aisles for faster trucking. Operations are swift and fully mechanized with dependable ELPAR trucks. Trucks have special resistance units on starting circuits and brakes that are specially adjusted to insure smooth starts and stops. This holds the breakage of fragile green cores to a minimum.

Write for Case Histories showing how ELPAR Trucks save money in foundries.

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ELPAR truck carrying complete mold set on one rack.

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Saved $30,000 in one year
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Cut belting costs 50%
An Imperial Insulated Sahara Belt carrying hot core sand lasted twice as long as the best of four other belts tried in an Eastern foundry.

$900 savings in 8 months
Red hot scrap and 200°F. sand burned up two rubber belts in 8 months in a Detroit foundry. An Imperial Belt lasted 8 months, 8 days, saved $900 in belting costs and ended costly shutdowns for repairs.

In Imperial's thick case-history file is convincing evidence that your belting money will go farther on Imperial's superior construction: tough silver duck, asbestos insulated, saturated with Imperial's exclusive compounds to resist damage by heat, abrasion and impact.

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You expect more from Imperial . . . and you get more

With the Editors

WESTERN HOSPITALITY: In April I had the pleasure of making the circuit of AFS West Coast chapters. In a period of eight days I talked to the Southern California Chapter at Los Angeles, the Northern California Chapter at Berkeley, the Oregon Chapter at Portland, the Washington Chapter at Tacoma and the British Columbia Chapter at Vancouver. My only complaint is the

tightness of the schedule arranged jointly by the chapters which did not permit as much time in the cities of the Northwest as I would have liked.

The trip provided the opportunity of seeing old friends and of making many new ones. I saw a number of fine foundries doing excellent work, enjoyed greatly the beautiful scenery of the West Coast, and was received graciously by the audiences where I talked. Therefore, I would like to express again my appreciation to the folks who took time off from the job to meet me at the airport or to show me the points of interest in the various towns, or escort me through the various plants.

The accompanying illustration shows J. M. Snyder, Joseph Musto Sons-Keenan Co., San Francisco, and chairman of chapter publicity, greeting me at the Northern California meeting.

Whirlybird: I had my first helicopter ride at Atlantic City during the convention. While it is quite different from riding in the usual commercial plane, I found it an interesting experience, as did many who also saw the convention city from the air.

Otto A. Pfaff, president, Wheelabrator Corp., Mishawaka, Ind., and a director of Bell Aircraft Corp., Buffalo, arranged to have a Bell model 47, said to be the world's most famous commercial helicopter, operating from the beach in front of the auditorium to take interested convention visitors for a ride. Although fog held up operations at times, many of them did enjoy the experience.

The accompanying illustration shows the helicopter with (left to right) Harold H. Miller, vice president, and Otto A. Pfaff, president, Wheelabrator Corp., Harry W. Dietert, new vice president of AFS, and the editor.

—o—

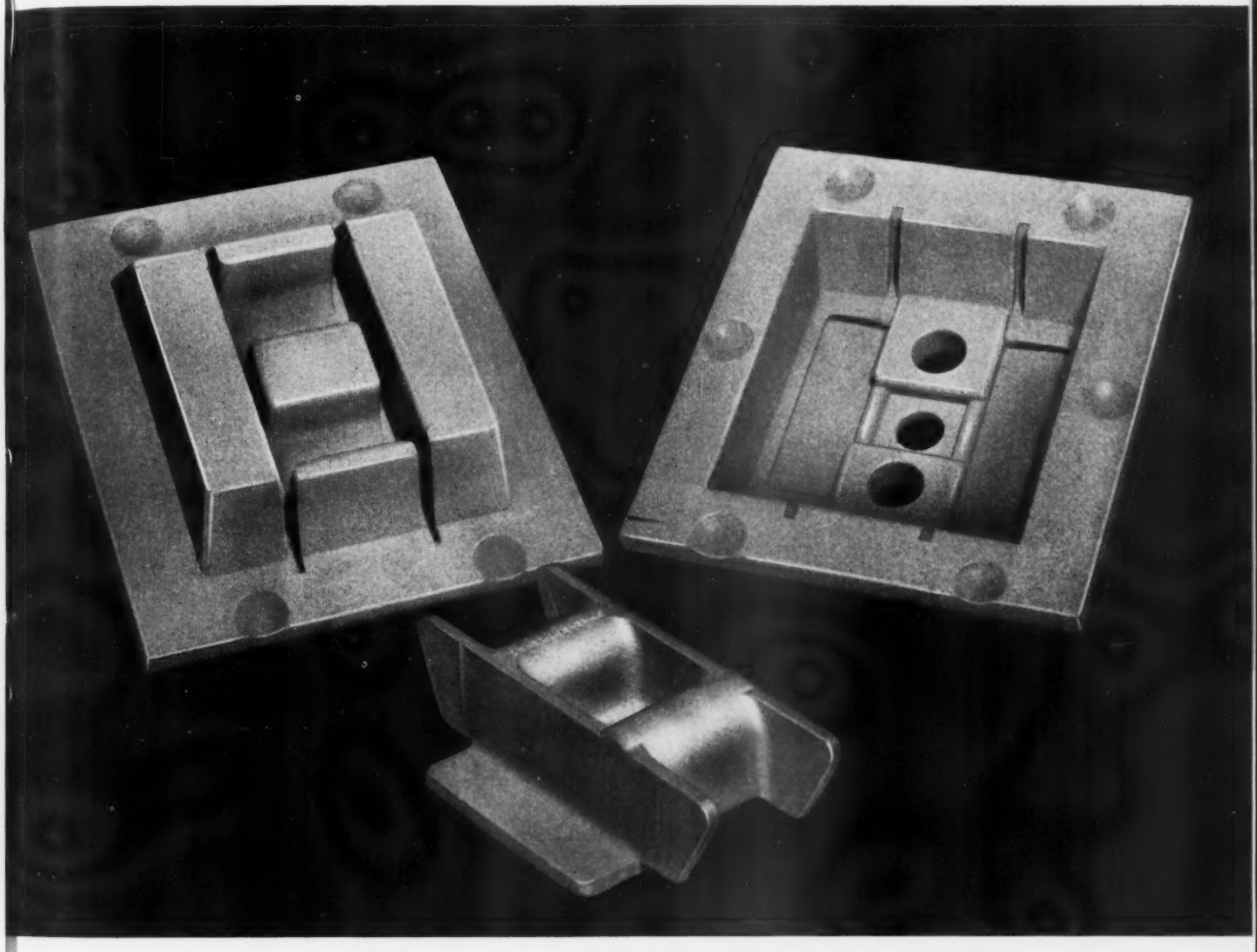
Congratulations: Our good friend Albert F. Pfeiffer, superintendent of pattern shops, Allis-Chalmers Mfg. Co., West Allis, Wis., recently received a 50-year service award, consisting of a wrist watch, a certificate and a 50-year service pin, from the company. Presentation was made at a banquet of the Allis-Chalmers Foremen's Club by Anthony Lebesch, works manager, Foundry Division.

In addition, the pattern shop foremen presented Al with one of those easy-type chairs and the accompanying illustration shows him doing some of his home work. If you will look closely, you will note that he is enjoying the pages of this old family (foundry, that is) journal.

Al Pfeiffer signed the pattern-maker's four-year apprentice con-

Monsanto announces newly developed

RESINOX* COLD COATING RESINS



Improved phenolic coating resins for shell molding reduce mixing time—eliminate caking problems of stored coated sands!

From the Foundry Research Laboratory at Monsanto comes a new Resinox formulation to improve the efficiency of your shell molding operations.

Resinox Cold Coating Resins have been extensively field-tested with dump box and blowing equipment—and have demonstrated outstanding free-flowing and non-segregation characteristics. With normal coating practice no caking is encountered in the coated sand.

The new Monsanto resins simplify coating formulation—just weigh out solvent and resin, then mix with sand. Using either the alcoholic deposition or liquid coating technique, the mixing cycle is appreciably shortened.

The shell molds made with these resins have excellent finish with superior hot strength and detail accuracy. Castings produced require little or no finishing. Edges are sharp and clean—intricate detail is no problem.

Because the economy and quality of shell molding depends so much on the resin used, you will want more specific information on this development. Send for data sheets and literature on the new Resinox Cold Coating Resins. Write Monsanto Chemical Company, Plastics Division, Room 449, Springfield 2, Massachusetts.

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*Resinox: Reg. U. S. Pat. Off.

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3X Blazecrete . . . the 3000F refractory . . . is easily and quickly applied . . . mix with water like ordinary concrete, and slap-trowel to desired thickness. Hardens without application of heat. Contains no harmful irritants . . . safe even for hand application. 3X Blazecrete is furnished as a dry mix, and may be stored indefinitely without deterioration.

You'll also find 3X Blazecrete ideally suited for forming run-out spouts and for gunning parts of iron cupolas.

Send for free brochure on Blazecrete (RC-28A) describing its properties and uses. To obtain your copy—as well as additional application details—write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 565 Lakeshore Road, Port Credit East, Ontario.

Whether you gun it... *or slap-trowel it...*

JOHNS-MANVILLE JM PRODUCTS **Johns-Manville BLAZECRETE**

BUILDS BETTER REFRACTORY LININGS

tract with the Dickson Mfg. Co., Scranton, Pa., on Dec. 15, 1902, so that he has over 53 years of continuous service in the foundry industry. It is interesting to note that the company was sold in two sections, one being purchased by Allis-Chalmers. Al, therefore, has been with a single organization for the full length of his service in the foundry industry. Al has served the foundry industry in many ways. He is a past president of the Wisconsin Chapter of AFS and a past chairman of the Pattern Division of the society. He

received an honorary life membership at the Houston convention. He was much in evidence at Atlantic City last month.

Congratulations, Al, on a wonderful record of service to your company and to the foundry industry.

—o—

A Name: During my recent West Coast visit, I ran across J. R. "Dick" Ludwig, foundry superintendent, Soundcast Co., 17th and Placentia, Newport Beach, Calif. Now there is a company name which really describes the type of product all foundries would like to produce.

—o—

Hole in the Lid: Publicity men have a hard time with foundry terminology. For example, a recent photograph received at this office has a caption reading, "Molten aluminum is shown being poured through a hole in the lid of a mold."

—o—

Thanks: All of us from both the editorial and business departments appreciate greatly the attention given the FOUNDRY booth at the Atlantic City convention. We surely enjoyed visiting with so many of our good friends in the foundry and allied industries. If we were not in the booth when you called, please forgive us. While we tried, we found it most difficult to be at several places at the same time.

Thanks again for dropping in during the show. Now, come to see us at the Penton Building, in Cleveland.

F.G.S.

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the watchword with

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Calendar of MEETINGS

June 5-8—Material Handling Institute, exposition, Cleveland Public Auditorium, Cleveland

June 11-12—Malleable Founders' Society, general meeting, The Homestead, Hot Springs, Va.

June 11-23—Engineering College, State University of Iowa, management course, State University of Iowa, Iowa City, Iowa.

June 17-21—American Society of Mechanical Engineers, semiannual meeting, Hotel Statler, Cleveland.

June 17-22 — American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 24-26—Alloy Casting Institute, annual meeting, The Homestead, Hot Springs, Va.

July 17-30—Materials Handling Training Conference, Lake Placid, N. Y.

Sept. 1-9—Association of German Foundrymen. International foundry exhibition and trade fair, Dusseldorf, Germany.

Sept. 9-12—National Metal Trades Association, eastern plant management conference, Essex-Sussex Hotel, Spring Lake, N. J.

Sept. 11-13—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 16-21—American Chemical Society, annual meeting, Convention Hall, Atlantic City, N. J.

Sept. 16-22—American Society for Testing Materials, Pacific area national meeting and apparatus exhibit, Hotel Statler, Los Angeles.

Sept. 17-21—Instrument Society of America, instrument-automation conference and exhibit, Coliseum Bldg., New York.

Sept. 24-25—Steel Founders' Society of America, annual fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Sept. 24-26—Material Handling Institute, fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Sept. 25-28—Association of Iron and Steel Engineers, iron and steel exposition, Public Auditorium, Cleveland.

Sept. 27-29—National Association of Foremen, annual meeting, Jefferson Hotel, St. Louis.

Oct. 4-5—Magnesium Association, annual meeting, Drake Hotel, Chicago.

Oct. 8-12—American Welding Society, fall technical meeting, Hotel Cleveland, Cleveland.

Oct. 8-12—American Society for Metals, national metals congress and exposition, Public Auditorium, Cleveland.

Oct. 11-12—Armour Research Foundation, national noise abatement symposium, Hotel Sherman, Chicago.

Oct. 11-12—National Foundry Association, annual meeting, Sheraton-Cadillac Hotel, Detroit.

Oct. 18-20—Foundry Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 20-23—Conveyor Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 29-30—Refractories Institute, fall meeting, The Homestead, Hot Springs, Va.

Oct. 30-Nov. 2—Gray Iron Founders' Society, annual meeting, The Homestead, Hot Springs, Va.

Oct. 31-Nov. 1-2—Industrial Management Society, time and motion study and management clinic, Hotel Sherman, Chicago.

Nov. 8-9—All-Canadian Foundry Conference, sponsored by Eastern Canada, Ontario and British Columbia chapters of AFS, Sheraton-Mount Royal Hotel, Montreal.

Nov. 25-30—American Society of Mechanical Engineers, annual meeting, Hotel Statler, New York.

Nov. 26-30—Third International Automation Exposition, New York Trade Show Bldg., New York.

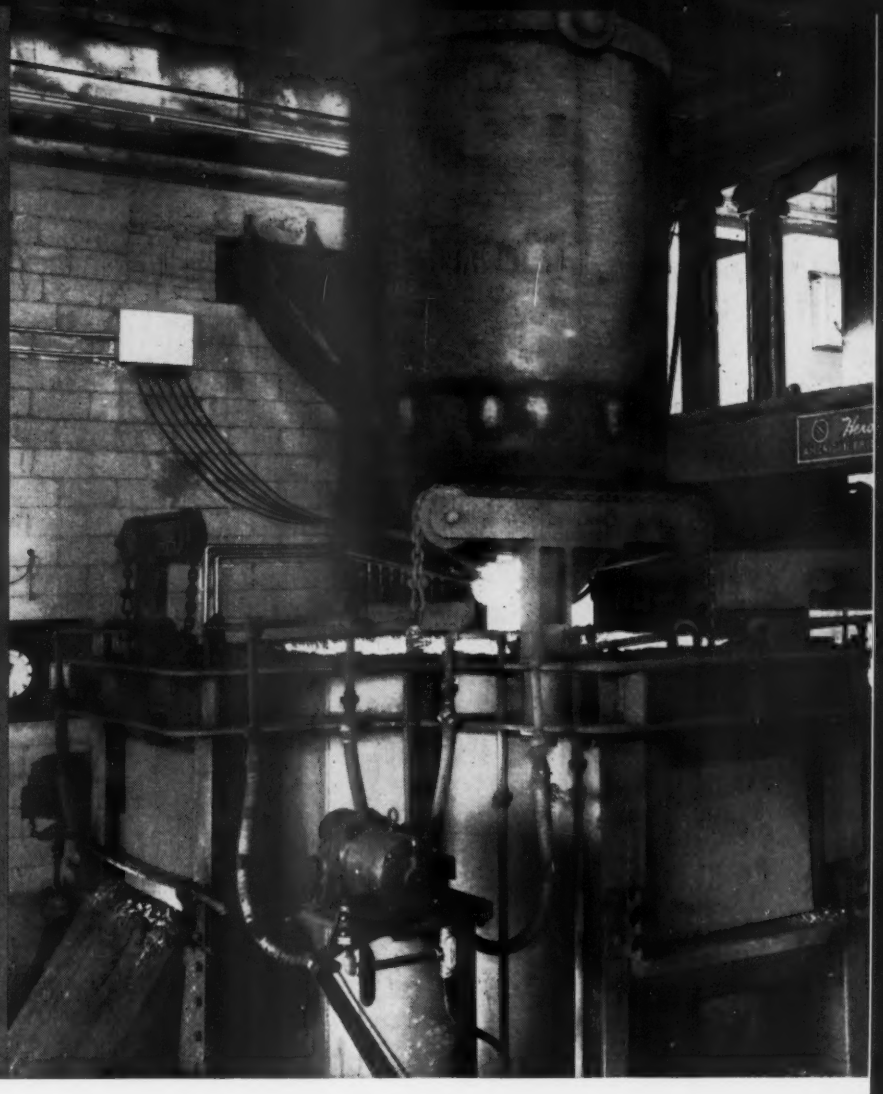
Nov. 29-30—Michigan Regional Foundry Conference, Union Bldg., University of Michigan Ann Arbor, Mich.

Dec. 5-7—American Institute of Mining and Metallurgical Engineers, electric furnace steel conference, Morrison Hotel, Chicago.

1957

Feb. 4-8—Gray Iron Founders' Society, committee week and spring meeting, Benjamin Franklin Hotel, Philadelphia.

The Heroult ELECTRIC FURNACE



. . . an excellent and economical producing unit for the small foundry!

In these days of keener competition, it behooves you to weigh every possibility for improving your output, and the quality of your product. *A better, faster method of melting may be the answer to your problem.*

In the small steel foundry, as well as in the iron foundry, where a high grade product is demanded, the Heroult Electric Melting Furnace has proved to be an excellent and economical producing unit.

The Heroult is the safest, most dependable electric furnace on the market. Available in foundry sizes with either Gantry or swing-type roof, the Heroult is equipped with the latest time and labor-saving mechanical devices and electrical controls. It is noted for its efficient performance, simplified operation, and low operating and maintenance costs.

We welcome an opportunity to help you determine how you can use this modern electric furnace in your shop. An inquiry will receive the prompt and careful attention of our furnace engineers.

AMERICAN BRIDGE DIVISION
UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.
Contracting Offices in New York, Philadelphia, Chicago,
San Francisco and other principal cities.
United States Steel Export Company, New York

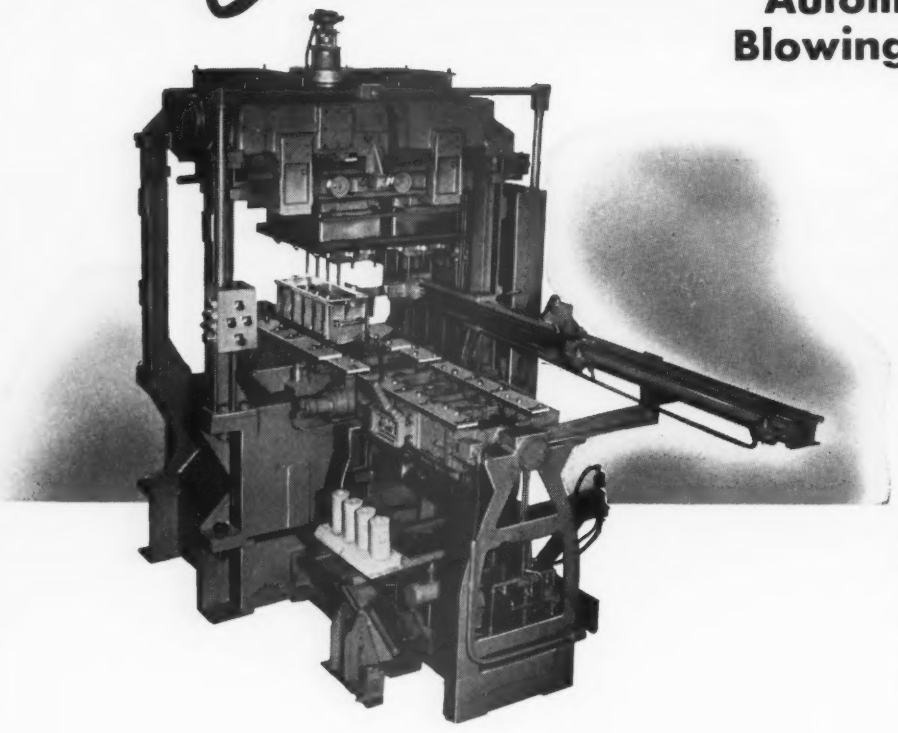
USS

SEE **THE UNITED STATES STEEL HOUR.** It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

UNITED STATES STEEL

YOUR *Automatic Foundry*

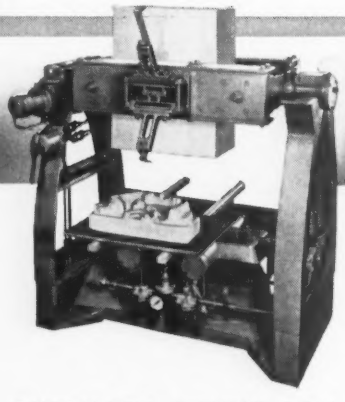
Automatic Core Blowing Machines



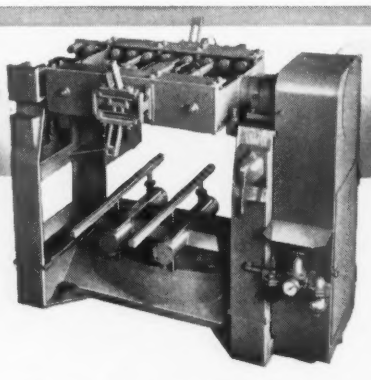
SUTTER SP-221 "MECHANICORE" DUAL HEAD AUTOMATIC CORE BLOWER—Automatically blows up to 250 consistently high quality cores per hour. Amazing flexibility with two refill stations . . . as one head blows, other refills. Use 2 heads to double production on same core, blow 2 different cores using 2 different sands, or use as single blower and change over fast when needed. Shown equipped with Sutter Automatic Core Box Transfer Device and Automatic Double Roll-over and Core Draw Machine with Core Pushout Device and Core Elevating Device. Maximum core box size 36″ long x 16″ wide x 8½″ deep. Maximum core weight 125 pounds. Single Head (Model SP-220) also available.

Automatic Core Draw Machines

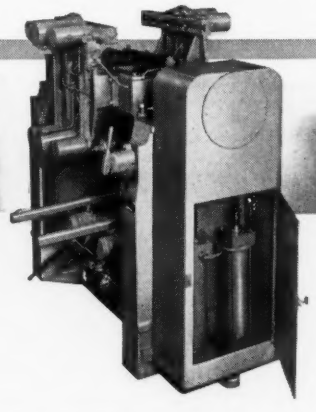
Completely automatic cycle boosts core production from 300% to 400% and provides uniform high quality, since human element is removed from draw operation. Operator merely places core dryer. Dryer is clamped, box rolled over and core drawn automatically without any attention from operator. When unit is used with a blower, operator easily performs both blow and draw operations. Three standard models in variety of sizes.



AUTOMATIC DOUBLE ROLL-OVER CORE DRAW MACHINE—Standard duty series, maximum core weight 60 pounds. Automatic core pushout device and elevator mechanism also available for this and all other Sutter Core Draw Machines. Minimum cycle, 6 seconds.



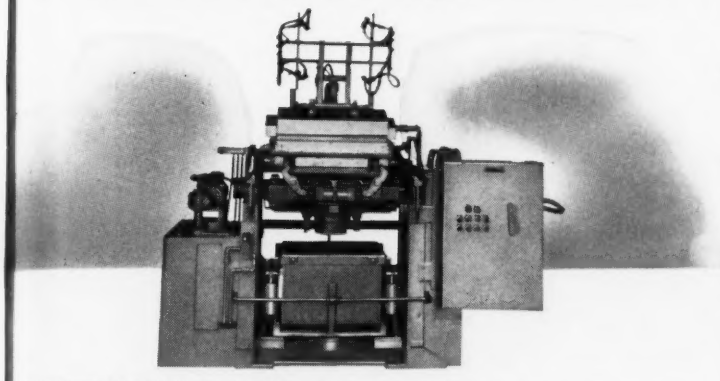
AUTOMATIC DOUBLE ROLL-OVER CORE DRAW MACHINE for heavy duty operation. Minimum operating cycle, 6 seconds. Maximum core box size, 9¼″ deep x 20″ wide x 30″ long. Maximum core weight, 150 pounds. Available in three standard sizes.



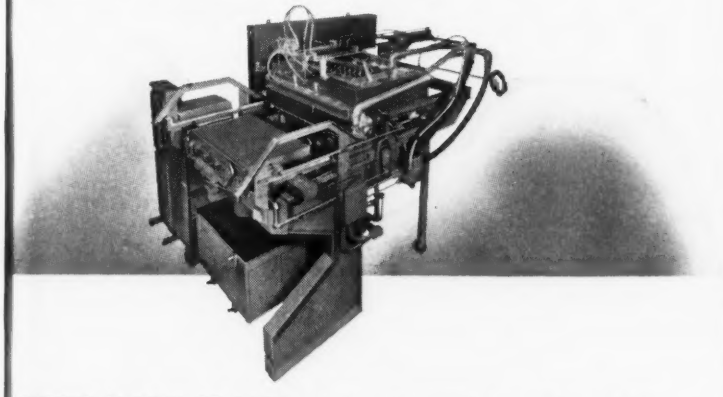
AUTOMATIC DOUBLE ROLL-OVER CORE DRAW MACHINE with side drawbacks. SP-540 Series. Minimum cycle, 20 seconds. Maximum core box size, 26″ long x 13″ wide x 10″ deep. Ideal for both high production and jobbing work. Maximum output—minimum operator fatigue.

IS CLOSER THAN YOU THINK!

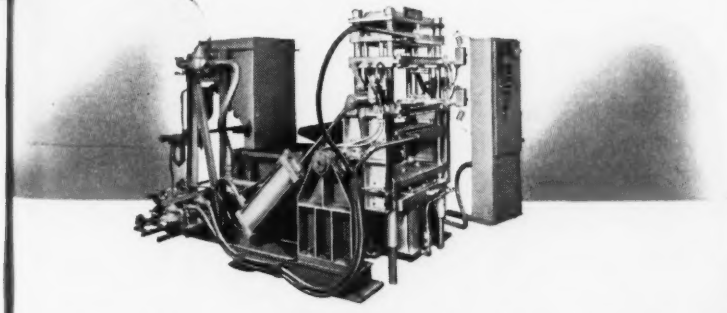
Automatic Shell Core and Shell Mold Blowing Machines



SUTTER MODEL SP-1000—Produces fully-cured, smooth, precision shell molds. Adjustable coating and curing times. Oven and pattern temperatures thermostatically controlled. Completely automatic cycle assures quality control, even with unskilled operator. On short runs, entire pattern area can be used for various patterns by using Sutter Quick Change Mask. Maximum mold size, 20" x 30" x 6" high.



SUTTER MODEL SP-1100—Automatic production of precision, high-quality shell molds at 40-50 cycles per hour. Adjustable coating and curing times. Oven and pattern temperatures thermostatically controlled. Pattern plates have integral stripper pins for lower pattern costs, faster pattern changeover and, for short runs, entire pattern area can be utilized with Sutter Quick Change Mask. Maximum mold size, 26" x 41" x 12" high.



SUTTER MODEL SP-1300—Automatic Shell Core and Shell Mold Blower. Blows and fully cures solid or hollow precision cores at 50 to 90 cycles per hour. Shell molds produced on this machine are as accurate on the outside as the inside. Maximum box size, 14" x 24" x 10"; maximum draw, 5"; maximum core or mold weight, 16 pounds. (Larger Model SP-1400 has box size 20" x 38" x 10".)

★ **CUT COSTS**

★ **IMPROVE QUALITY**

★ **INCREASE PRODUCTION**

with this Sutter "Advanced Design" Automatic Foundry Equipment!

Whether your foundry is large or small, your production runs long or short . . . Sutter equipment will bring you the benefits of modern automatic core and mold production for a surprisingly modest investment.

Sutter Core Blowing, Core Drawing and Shell Molding Machines are engineered and manufactured by an organization devoted exclusively to solving processing problems for production and jobbing foundries. Since work cycles on these machines are fully automatic, unskilled operators turn out the highest production with consistent top quality. The equipment is versatile, designed to be switched quickly from one job to another as needed. Maximum safety and minimum operator fatigue are features of every unit. All electric and pneumatic controls and equipment meet both J.I.C. standards and the latest national safety codes. Every Sutter machine is backed by years of experience in the foundry field, is practically engineered, built by skilled craftsmen from the finest materials, and thoroughly tested and inspected.

Sutter foundry equipment is proving its worth daily in foundries the world over, and has done so during years of satisfactory, efficient operation. Take steps now to make your foundry an "automatic foundry". The installation of low-cost Sutter equipment is a major step toward the economy of complete automation. Write today for full information.

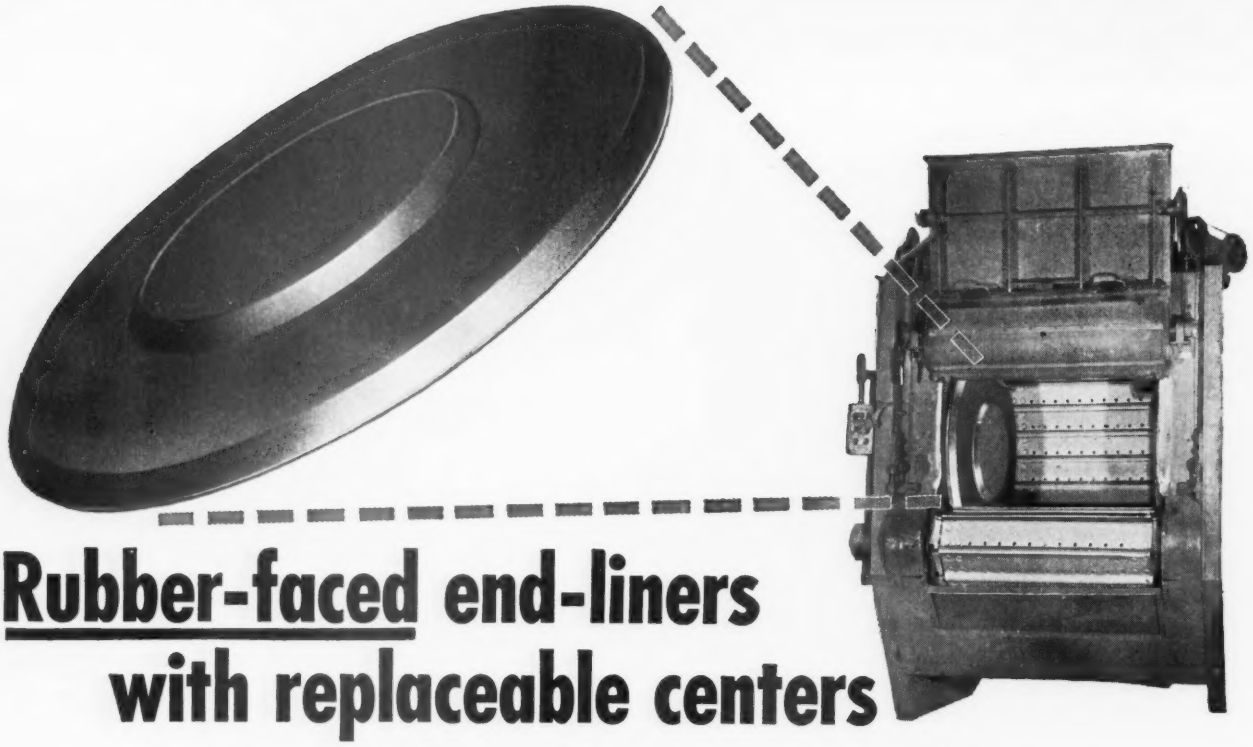
SUTTER

PRODUCTS CO.

Also designers and manufacturers of special equipment.

2005 WESTWOOD AVE. • DEARBORN, MICH.

Canadian and Overseas Mfr. & Dist'r.
FOUNDRY EQUIPMENT LIMITED, Leighton Buzzard, Bedfordshire, England



Rubber-faced end-liners with replaceable centers

...cut shot breakage up to 50%

...greatly increase end-liner life

With Gates rubber-faced shot blast discs you make BIG savings two ways:

1. **You save on shot because the rubber disc cuts shot breakage.**
2. **You save time and cost in making end-liner replacements.**

Here's why:

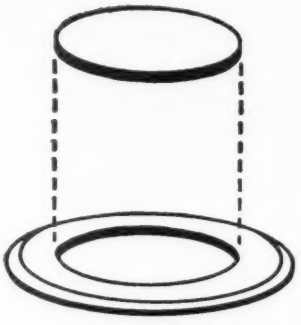
Heaviest wear on end-liners in shot blast and tumble blast machines comes in the center area. With either of Gates two types of disc (center patch, or hollow center), you replace only the center area as needed. Two or three center discs can be used before the main disc is finally worn through.

This important engineering development has increased end-liner service life up to FOUR TIMES.

And rubber protection of end-liners reduces shot breakage as much as 50% — giving you substantial savings on shot replacement costs.

For complete size and cost data, call your local Gates representative . . . or write to The Gates Rubber Co., Sales Division, Inc., Denver, Colorado.

The Mark of Gates Specialized Research



Hollow Center Disc with Patch Plate

Center disc is recessed flush in hollow center of main disc. Center can be replaced without replacing entire end-liner.

Solid Disc with Center Patch

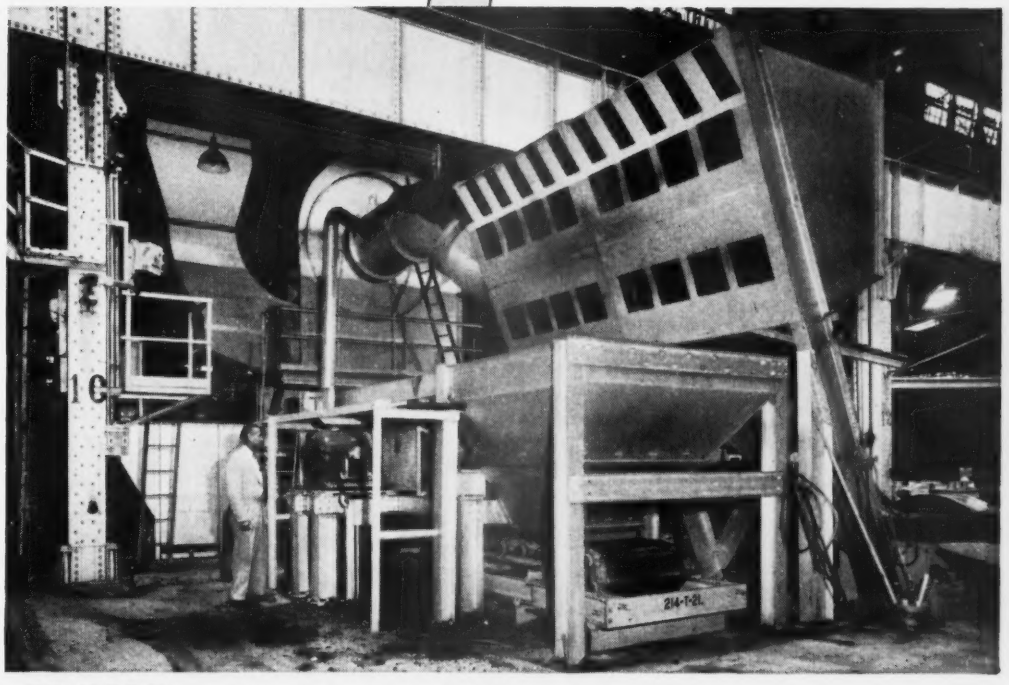
Both discs easily bolted to main structure of shot blast machine.

Gates Rubber-Faced Shot Blast Discs

TPA 103

More CFM Per Sq. Ft. of Space!

THERE'S ALWAYS ROOM FOR A ROTO-CLONE. Believe it or not, this compact AAF Type W ROTO-CLONE is exhausting *50,000 cfm* from this shakeout at General Steel Casting Corporation's Granite City, Ill. plant.



Type W ROTO-CLONE Exhausts 50,000 cfm In General Steel Castings Shakeout Operation

TO look at it, you'd hardly believe that this dust collector is capable of exhausting 50,000 cubic feet per minute from this shakeout. But here, as is the case with all space-saving AAF ROTO-CLONES, looks are deceiving.

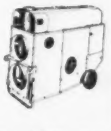
In the installation pictured above, at General Steel Casting Corporation's Granite City, Illinois plant, the Type W ROTO-CLONE exhausts the dust through a hood which runs the full length of the shakeout. Collected material goes into a settling tank equipped with drag-type sludge ejector for automatic de-watering and removal of sludge. The clean, affluent water overflows to the sewer.

High efficiency, minimum space, constant exhaust volume and maintained performance —these are the features of all AAF Dust Control Equipment.

For complete information about AAF Dust Control Equipment and practical assistance with *your* dust problems, call your local AAF representative or write direct to—

AAF herman nelson **American Air Filter**
COMPANY, INC.
266 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

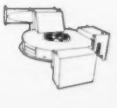
Herman Nelson Portable Heaters



Illinois Steam Heating Specialties

— BETTER AIR IS OUR BUSINESS —

AAF Electric Furnace Hoods



AAF Type K Exhauster

For more information, use Reader Service Card, page 229

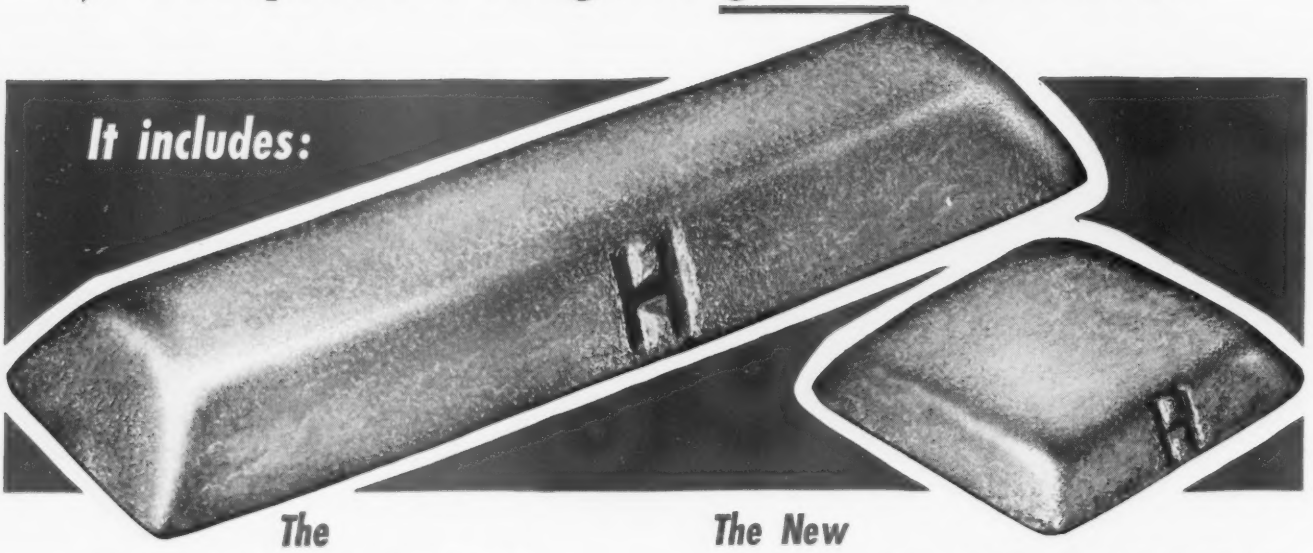
Now, more than ever, you can depend on

HANNA

as your best source for

PIG IRON

- *Our merchant capacity is bigger than ever*
- *Our plant is better than ever*
- *Our product range is greater than ever*



The

HANNA 38-POUND PIG

The foundryman's favorite standard pig. Available in all grades, silvery and HannaTite. A good example of the quality that has made Hanna "the best known name in iron."

The New

EXCLUSIVE HANNATEN INGOT

For 10-lb.-pig users, this new ingot means no free-carbon pockets, finer grain structure, more even melting. Available in all grades, silvery and HannaTite—an extra-close-grain iron.

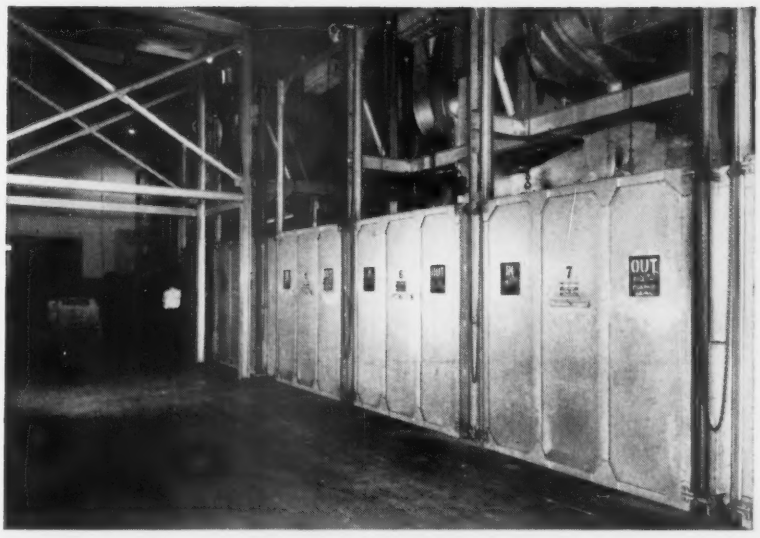
THE HANNA FURNACE CORPORATION

Buffalo • Detroit • New York • Philadelphia

Merchant Pig Iron Division of

NATIONAL STEEL CORPORATION

How much money can you really save using



Coleman Transrack Ovens

COLEMAN OVENS

in your core department?

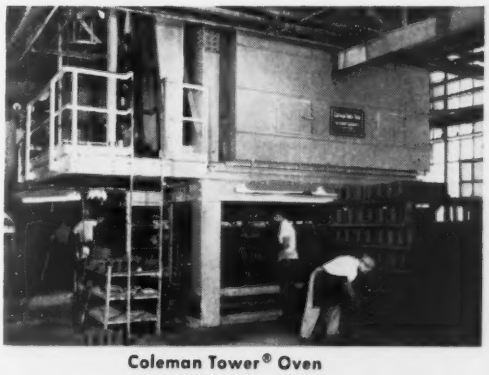
Performance records in all classes of foundries prove that Coleman Ovens reduce overall core department costs by as much as 50%! In fact, many Coleman Ovens pay for themselves out of savings in less than a year!

Coleman Core and Mold Ovens, through modern engineering and more than half a century of specialized foundry experience, have an outstanding record for reducing scrap losses, fuel, material and labor costs. The uniform heating, accurate controls and work handling methods found exclusively in Coleman Ovens are responsible for immediate improvement in cores, molds and casting quality.

Since production savings are so important to profits, it will pay you to investigate the unusual advantages of Coleman Ovens immediately. Let our experienced engineers show you how modern Coleman Ovens can pay dividends in your foundry.

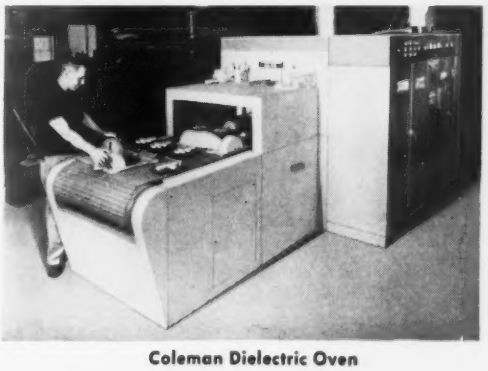
As builders of the world's only complete line of foundry ovens, we have no reason to recommend any but the best oven for your purpose.

WRITE FOR BULLETIN 54



Coleman Tower® Oven

Coleman Car-Type Oven



Coleman Dielectric Oven

A COMPLETE RANGE OF TYPES AND SIZES:

for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens • Car-Type Core Ovens • Car-Type Mold Ovens • Transrack Ovens • Rolling Drawer Ovens • Portable Core Ovens • Portable Mold Dryers • Dielectric Core Ovens

THE FOUNDRY EQUIPMENT COMPANY

1821 COLUMBUS ROAD CLEVELAND 13, OHIO

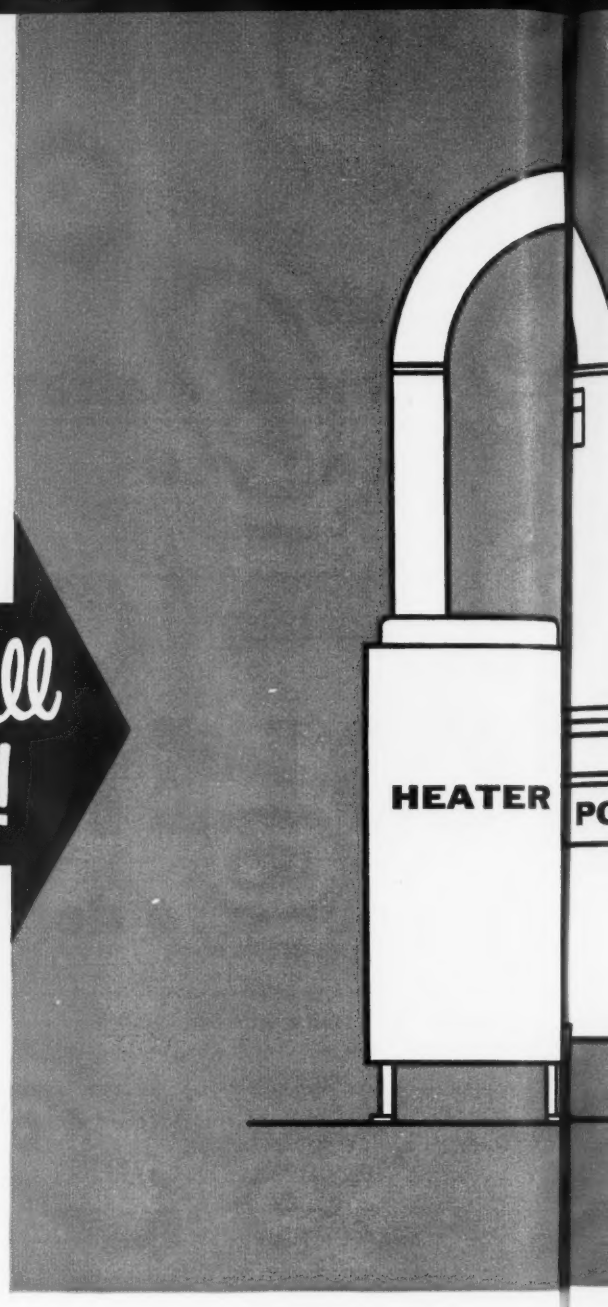
WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

TURN OUT

800-1200 LBS. OF COATED SAND PER HOUR

WITH THIS LOW COST

NATIONAL Shell-Mull Unit!



You get . . .

- **CONTROLLED COATING**
- **LOWER EQUIPMENT COSTS**

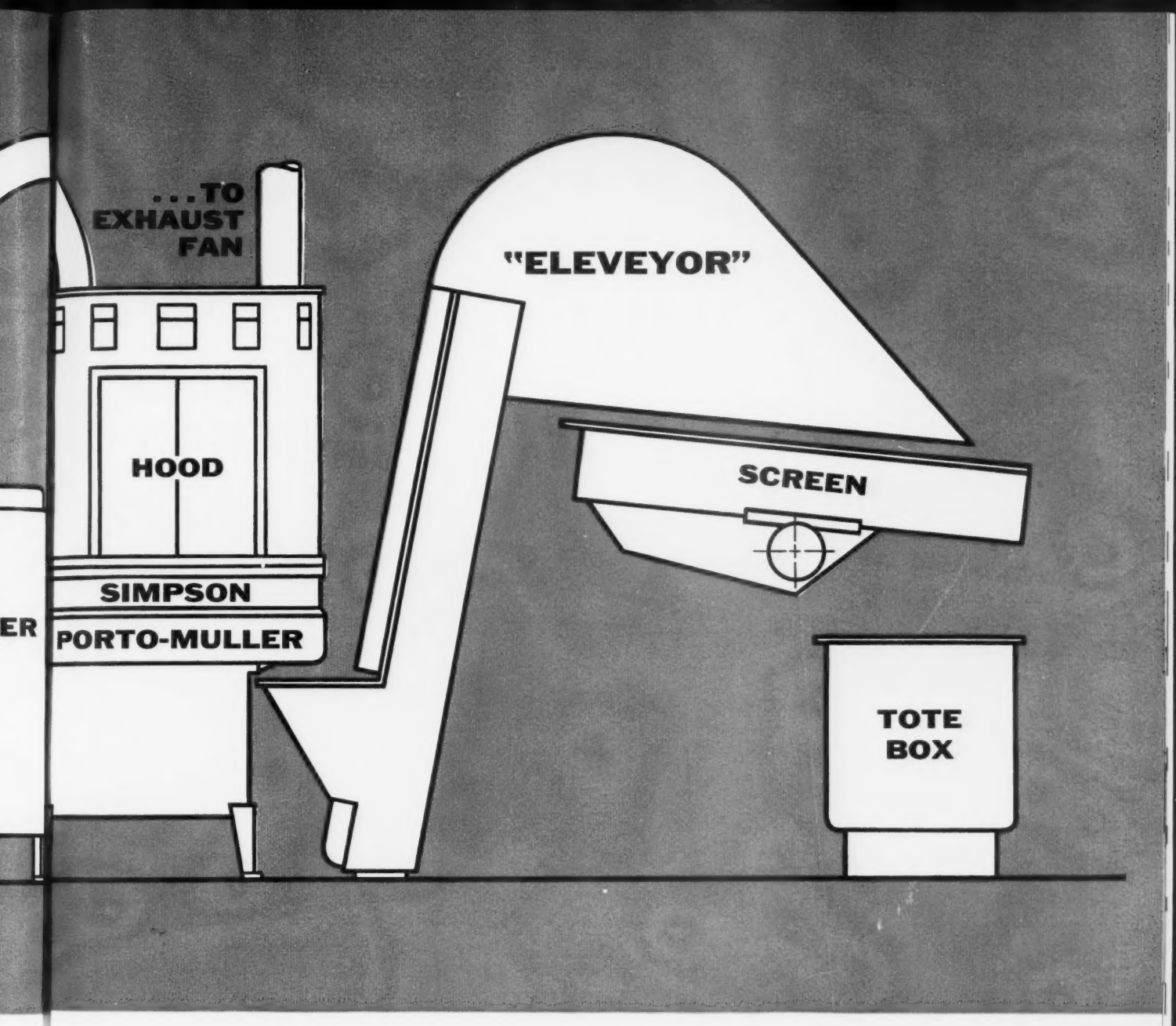
and you can . . .

- **USE YOUR PRESENT SIMPSON MIX-MULLER**

Porto-Muller (wheels removed) Handles 200 to 250 lbs. of coated sand per batch.

This simple, completely practical, standardized unit will turn out 800 to 1200 lbs. of coated sand per hour—every hour, with a Simpson Porto-Muller!—The same packaged deal is available for *any* Simpson Mix-Muller too! You can handle up to 4000 lbs. per batch with a 3F Mix-Muller. And if you now have a Simpson you can use it—*without* beefing up the drive.

Yes, National again proves its leadership in *progressive* foundry equipment planning with a *practical* coated sand unit.



These features mean increased hourly production with positive control over coated sand.

UNIFORMITY from batch to batch. Equipment design reduces sensitivity to variation in mixing time, temperature, etc.

LARGE BATCH reduces percentage of error due to slight variations in sand and resin weight. Hot air addition results in shorter mixing cycle.

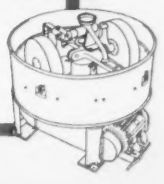
LOWER OPERATING COSTS. Standard motor and drive used on all Mix-Mullers. You use less power and get longer part life.

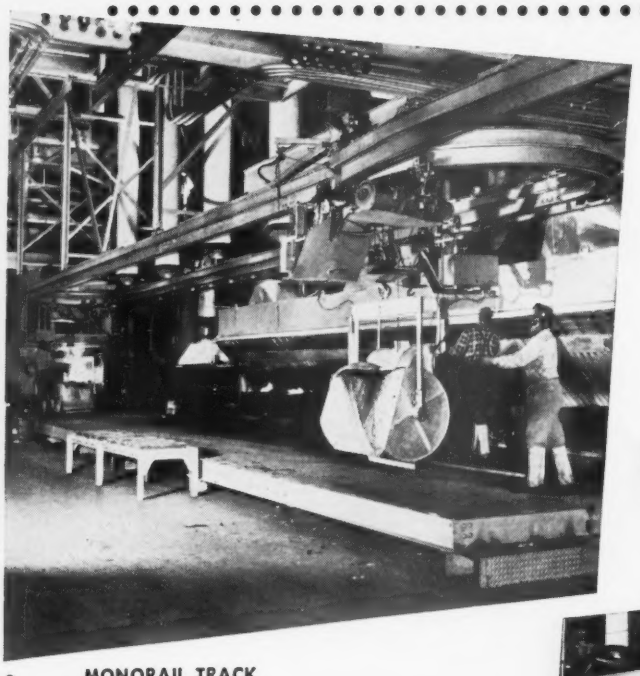
SEPARATE HEATER gives positive control of sand and air temperature—*independent of muller cycle time.*

UNIFORM COATING. Proven mulling action does not heat sand. Increased tensile strength can mean you use less resin to get *better* physical properties.

National Engineering Company

646 Machinery Hall Bldg. • Chicago 6, Illinois





MONORAIL TRACK

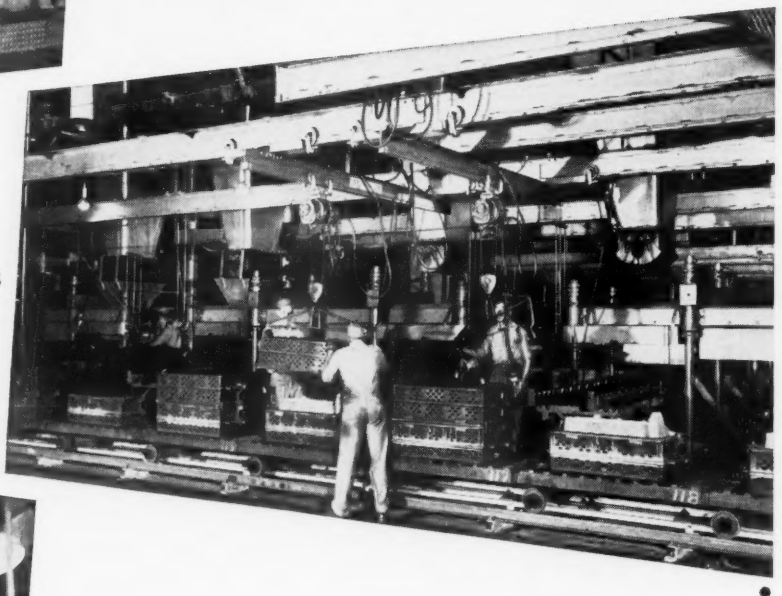
use

MONORAIL SPECIFICATIONS

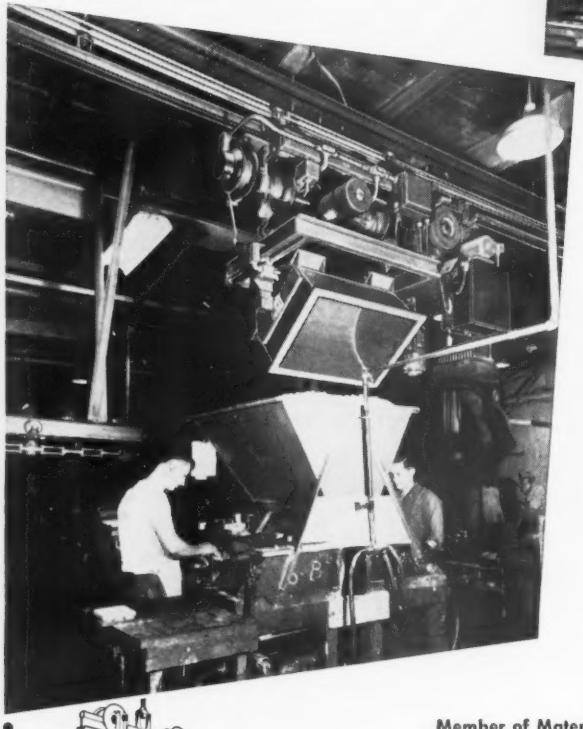
for

MAXIMUM SAFETY MINIMUM MAINTENANCE

MONORAIL CRANES



AUTOMATIC DISPATCH



By following the guide prepared by members of the MonoRail Manufacturers Association when purchasing materials handling equipment, you are assured of getting maximum safety and minimum maintenance and still satisfy your operating requirements.

The guide represents the efforts of the combined experience of all the engineers of the association members. The specification guide has just been published.

A copy of these specifications will be forwarded on request. Write also for a copy of the American MonoRail Bulletin C-1 describing hundreds of successful solutions to handling problems.

Member of Materials Handling Institute — MonoRail Association

See Us In Booth #1419 MHI Exposition June 5-8

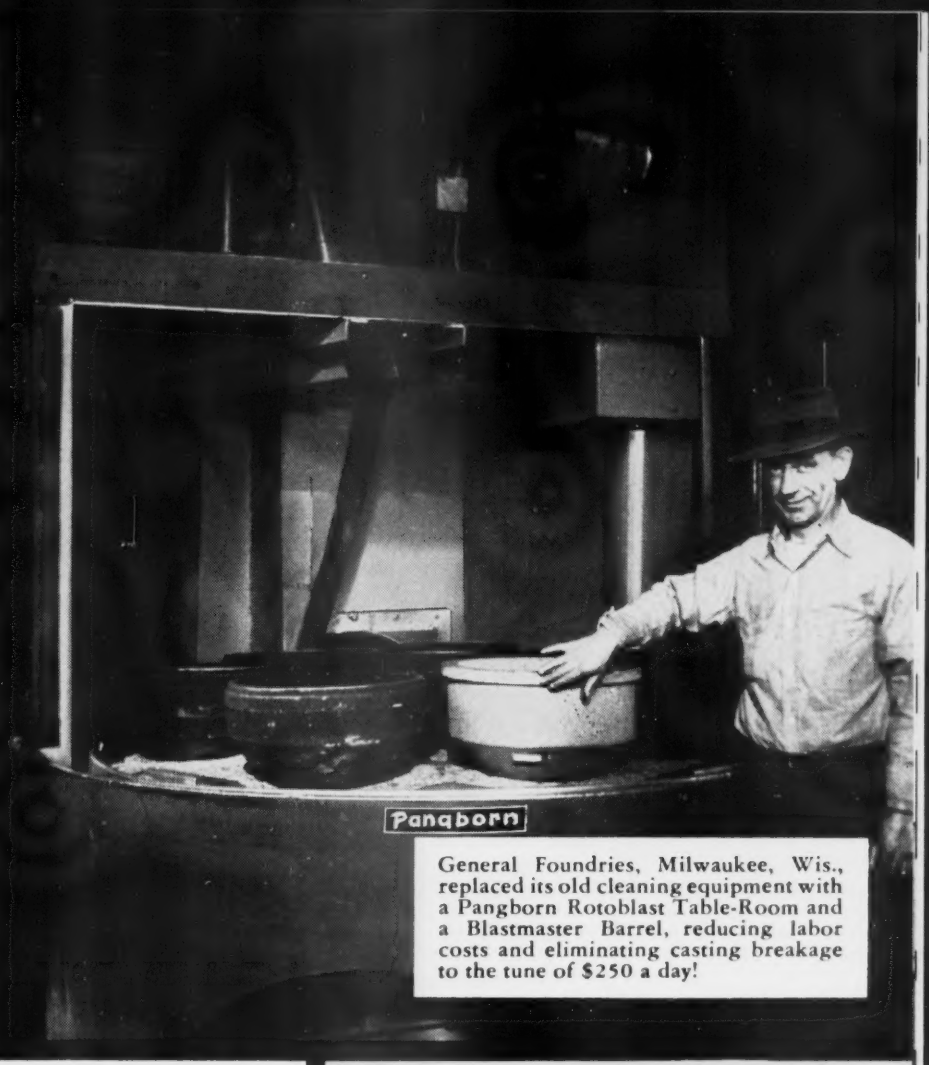
AMERICAN OVERHEAD HANDLING EQUIPMENT

MONORAIL COMPANY

13104 ATHENS AVENUE
CLEVELAND 7, OHIO

[IN CANADA—CANADIAN MONORAIL CO., LTD., GALT, ONT.]

Pangborn Rotoblast® Cuts Cleaning Costs $250 a Day for General Foundries!

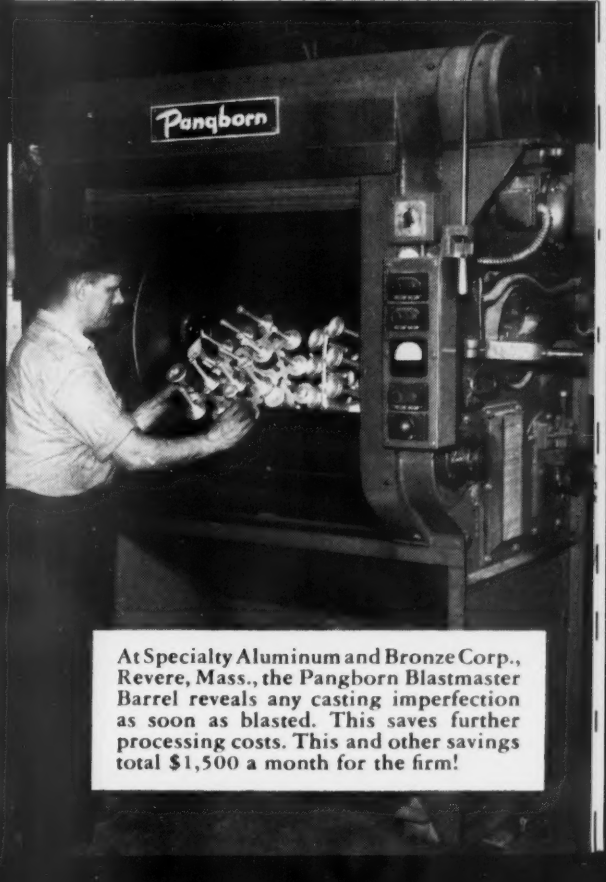


General Foundries, Milwaukee, Wis., replaced its old cleaning equipment with a Pangborn Rotoblast Table-Room and a Blastmaster Barrel, reducing labor costs and eliminating casting breakage to the tune of $250 a day!

Some foundrymen tell us they're most impressed with Pangborn Rotoblast's speed of cleaning, its high production rate. Others praise the quality of its work . . . the manpower reduction due to its automatic operation. But whatever the reasons—cleaning quality, speed, lower labor and maintenance costs, no abrasive loss—they all add up to the fact that Pangborn Rotoblast gives you *lower cost per ton of castings cleaned.* And, in the final analysis, this figure determines the efficiency of your blast cleaning operation.

Investigate Pangborn Rotoblast and discover which machine can best streamline your operating costs! Write for Bulletin 227 to PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

And $1,500 a month for Specialty Aluminum and Bronze!



At Specialty Aluminum and Bronze Corp., Revere, Mass., the Pangborn Blastmaster Barrel reveals any casting imperfection as soon as blasted. This saves further processing costs. This and other savings total $1,500 a month for the firm!

Pangborn

BLAST CLEANS CHEAPER

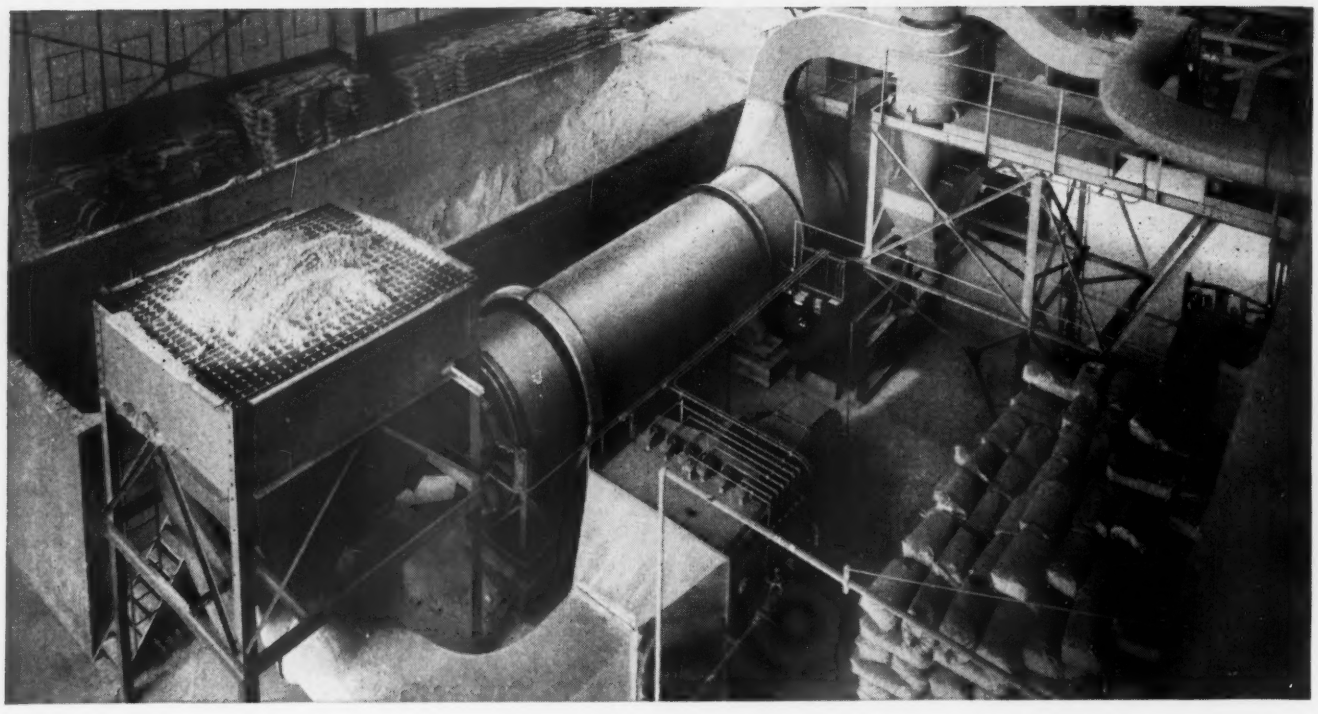
Rotoblast Blastmaster® & Continuous-Flo Barrel

Rotoblast® Tables & Table-Rooms

Special Blast Rooms & Cabinets

Pangborn Dust Control Equipment

Distributors for Malleabrasive and Tru-Steel Abrasives



Link-Belt Roto-Louvre dryer above handles 15 tph of sand at large midwest foundry. Sand is delivered from dump hopper to dryer by 16-in. screw feeder. Heated input air is supplied by gas-fired furnace in foreground.

DRY MORE SAND IN LESS SPACE

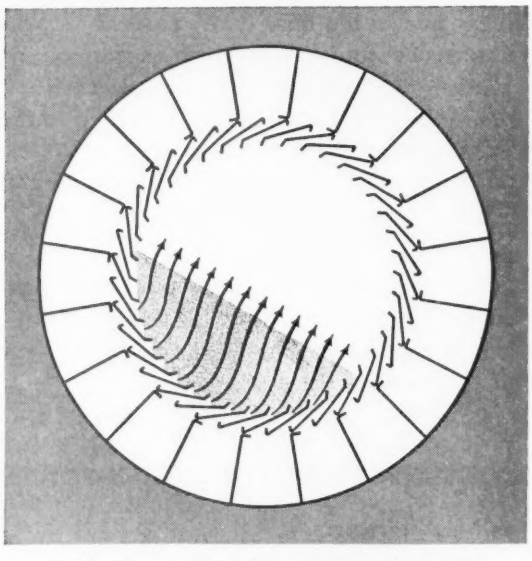
LINK-BELT Roto-Louvre Dryers deliver cool, uniformly dried sand that gives you better castings

YOU can't produce top quality castings unless you use sufficiently cooled, dry sand. And many foundries have discovered the low-cost answer to needed capacity in the Link-Belt Roto-Louvre Dryer utilizing *controlled* high temperatures.

Roto-Louvre's efficiency develops from an exclusive design by which dry air introduced through the louvres contacts every particle. You get maximum capacity in half the space generally demanded by other equipment.

What's more, dependable heat control avoids problems encountered with other dryers using high temperatures. Ordinary types often produce sand too hot to handle readily—that won't mix properly with core oil. Alternative: an extra cooler, needless expense.

Get complete information from a foundry specialist through your nearest Link-Belt office. Or write direct for Book 2511.



Gradual heat transfer from gentle rolling action over slowly revolving louvres eliminates spotty over- or under-drying. Sand is discharged at 120 to 135° F, containing a maximum of 0.5% of moisture. In installations where temperatures to as low as 100° F are required, a combination dryer-cooler can be furnished. Link-Belt builds eight sizes of Roto-Louvre Dryers—in capacities from 1 to 60 tph.

LINK-BELT

13,793

HANDLING and SAND PREPARATION MACHINERY

MEMBER FEMA

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

. . . loading is smooth and there's a scooping action with tip-back bucket.

. . . mobile ramp is pulled from bin to bin by the Tracto-Loader.

SAVES 21 MAN-HOURS UNLOADING BOXCAR

with compact TRACTOMOTIVE TL-6 TRACTO-LOADER— a high producer in confined areas

A boxcar of bulk materials is now unloaded in two to three hours with a TL-6 Tracto-Loader at Cambridge Tile Manufacturing Co., Cincinnati, Ohio — manufacturer and national distributor of Suntile, a fine clay tile for homes and industrial buildings. This includes the time it takes to spot a mobile ramp and set up a portable belt conveyor and hopper. The former hand labor method took 24 man-hours to empty a car!

The mobile ramp is pulled from bin to bin by the Tracto-Loader . . . then this compact, half-yard machine drives up the ramp and makes a right angle turn over a bridge into a boxcar. Its short, 6½-foot turning radius enables it to scoot around easily in the car. There's no time-consuming gear shifting, either — a pull or push on a single lever changes direction of loader.

The TL-6 gets big loads and delivers 'em to hopper fast. Instead of ramming to get load, operator lets the hydraulic torque converter do the crowding. It's smooth and positive . . . and there is a scooping action with the tip-back bucket. The full load is tucked in close to the cowl with the 50-degree tip back of bucket and carried low — means greater stability, better visibility, easier maneuvering.

See how the TL-6 can speed up the handling of bulk materials in your plant — even in the most confined areas. Arrange with your Allis-Chalmers Construction Machinery Dealer for a demonstration.

SOLD AND SERVICED BY YOUR ALLIS-CHALMERS CONSTRUCTION MACHINERY DEALER

Send For Free Descriptive Catalog On The Complete Line Of Tracto-Loaders ▶

TRACTOMOTIVE

TRACTOMOTIVE CORPORATION • DEERFIELD, ILLINOIS

TRACTOMOTIVE CORPORATION, Dept. F
Deerfield, Illinois

☐ Please arrange a demonstration of the TL-6
☐ Send catalog on Tracto-Loaders

Name .....
Title .....
Company .....
Address .....
City ..... State .....

Flexibility of this **UNIVERSAL MOLD CONVEYOR** helps boost earnings

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Molds move on the level, up, down and around. Jeffrey's Universal Mold Conveyor is flexible!

• Jeffrey's universal mold conveyor earned immediate acceptance when it was officially introduced at the 1954 Foundry Show, and today it's working in a dozen foundries around the country.

Note these advantages:

Flexible contour – Operates in both vertical and horizontal plane. Full operation at elevations to suit each operation.

No sliding wheels on curves—Wheels always radial to curves.

Smooth operation– Each car has individual adjustment to match Crawl Drive.

No lubrication needed – Equipped with sealed-for-life Ball Bearings, Oil Impregnated Bushings.

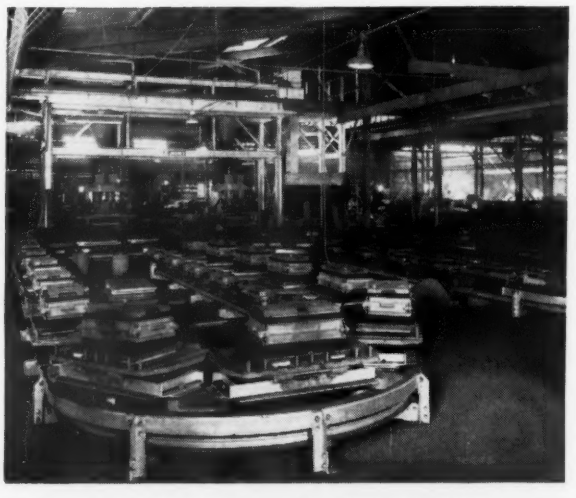
All moving parts shielded – Full protection from sand, shot and runout.

No sliding track for takeup – Internal Takeup on each car eliminates expensive foundations.

Rugged malleable iron chassis castings – Strength to spare for the toughest jobs.

Any type tops – Steel, Cast Iron, Roller Conveyor or Hinged Tops for Automatic Dump. Can be changed without interfering with conveyor.

Let Jeffrey foundry engineers show you how this system will help speed your production, cut costs and maintenance. The Jeffrey Manufacturing Company, Columbus 16, Ohio.

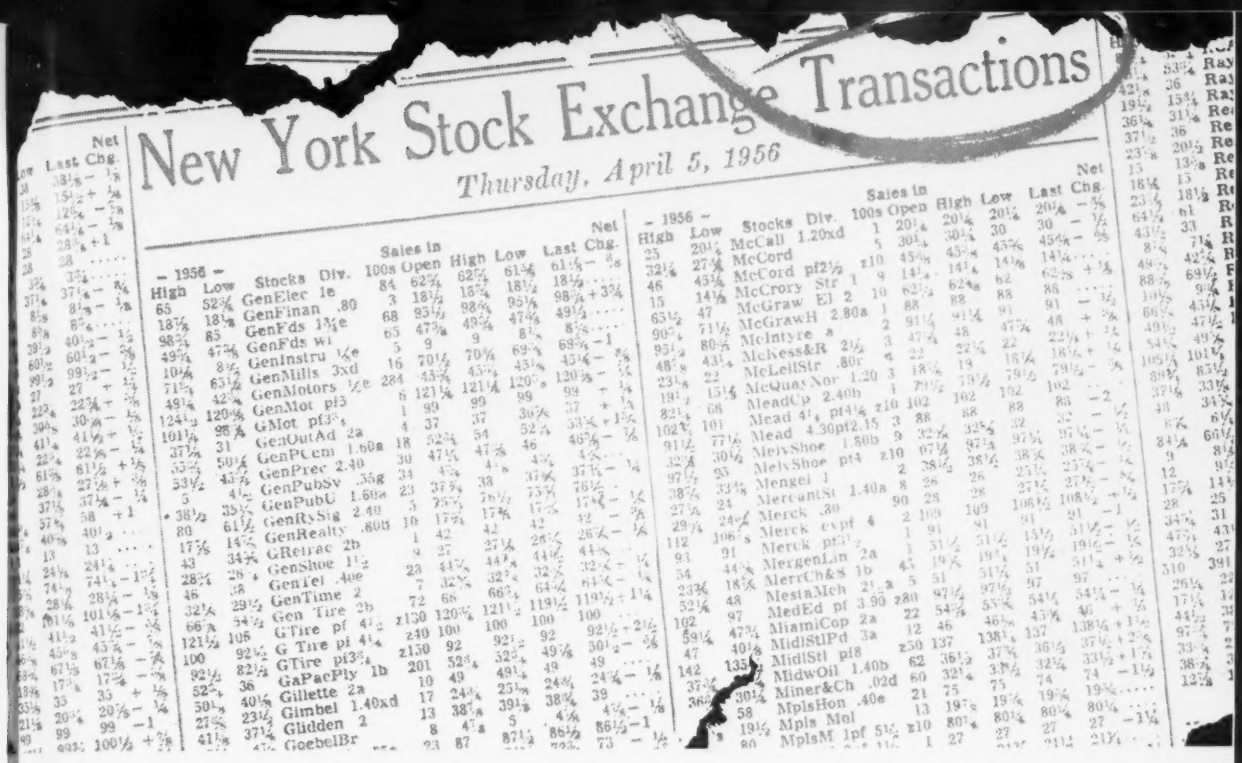


In service in a prominent iron foundry.

And in another modern foundry.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING


New York Stock Exchange Transactions

Thursday, April 5, 1956

1956 High	1956 Low	Stocks	Div.	Sales in 100s	Open	High	Low	Last	Net Chg.
65	52⅜	GenElec	1e	84	62⅝	62⅝	61⅝	61⅝	− ⅝
18⅞	18⅛	GenFinan	.80	3	18½	18⅝	18½	18½	
98¾	85	GenFds	1⅓e	68	95½	98¾	95⅛	98¼	+ 3¼
49¾	47⅜	GenFds	wi	65	47⅞	49⅛	47⅜	49¼	
10⅛	8⅛	GenInstru	⅛e	5	9	9	8⅞	8⅞	
71⅝	63½	GenMills	3xd	16	70½	70⅞	69¾	69¾	− 1
48¼	42⅝	GenMotors	½e	284	45⅜	45⅝	43⅞	45¼	− ⅝
124⅓	120⅜	GenMot	pf5	6	121⅛	121¼	120⅜	120⅜	− ⅝
101¼	98⅞	GMot	pf3¾	1	99	99	99	99	+ ¼
41¼	31	GenOutAd	2a	4	37	37	36⅞	37	+ ⅛
37⅛	30½	GenPCem	1.60a	18	52¾	54	52¼	52¼	− ⅝
55⅝	50¼	GenPrec	2.40	30	47½	47⅞	46	46¾	− ¾
53½	43⅝	GenPubSv	.35g	34	4⅝	4⅝	4⅝	4⅝	
5	4⅛	GenPubU	1.60a	23	37⅝	38	37⅜	37⅝	− ⅛
38½	35⅛	GenRyStk	2.40	3	75⅝	76½	75⅜	76¼	− ⅛
80	61½	GenRealty	.80b	10	17¾	17¾	17⅝	17⅝	− ⅛
17⅝	14⅝	GRefrac	2b	1	42	42	42	42	− ⅜
43	34⅝	GenShoe	1½	9	27	27¼	26¾	26¾	− ⅛
28¼	26	GenTel	.40e	23	44⅞	44¾	44⅛	44⅜	
46	38	GenTime	2	7	32⅝	32⅞	32⅜	32⅝	− ⅛
32⅞	29½	Gen Tire	2b	72	66	66¾	64¾	64¾	− 1¼
66⅜	54½	GTire pf	4½	z130	120¾	121¼	119½	119½	− 1¼
121½	105	GTire pf	4¼	z40	100	100	100	100	
100	92½	G Tire pi	4¼	z150	92	92½	92	92½	+ 2½
92½	82½	GTire pf	3¾	201	52¾	52¾	49⅞	50½	− ⅝
52¼	36	GaPacPly	1b	10	49	49¼	49	49	
50¼	40⅛	Gillette	2a	17	24¾	25⅛	24¾	24⅞	− ⅛
27⅝	23½	Gimbel	1.40xd	13	38⅞	39⅛	38¾	39	
41⅝	37½	Glidden	2	8	41⅜	5	4⅞	4⅞	− ⅛
		GoebelBr		23	87		87½	86½	− 1
30⅜	20⅝	McCall	1.20xd	1	20¼	20¼	20¼	20⅛	− ⅜
32⅛	27⅜	McCord		5	30¼	30⅛	30	30	− ½
46	45⅛	McCord	pf2½	z10	45⅝	45⅝	45⅛	45⅛	− ⅜
15	14⅛	McCrory	Str 1	9	14¼	14¼	14⅛	14⅛	
65½	47	McGraw	El 2	10	62⅝	62⅝	62	62⅜	+ ⅛
90⅝	71½	McGrawH	2.80a	1	88	88	88	88	
95¼	80⅝	McIntyre	a	2	91¼	91¼	91	91	− ⅛
48⅝	43¼	McKess&R	2½	3	47¾	48	47⅝	48	+ ⅜
23⅛	22	McLellStr	.80f	4	22	22	22	22⅛	+ ⅛
19½	15⅛	McQuayNor	1.20	3	18⅝	19	18¼	18¼	+ ⅛
82½	68	MeadCp	2.40b	1	79½	79½	79½	79½	− ⅜
102⅝	101	Mead	4¼ pf4¼	z10	102	102	102	102	
91½	77½	Mead	4.30pf2.15	3	88	88	88	88	− 2
32¾	30½	MelvShoe	1.80b	9	32⅝	32⅝	32	32	− ½
97½	93	MelvShoe	pf4	z10	97½	97¾	97½	97½	− ½
38⅞	33⅛	Mengel	1	2	38½	38½	38⅛	38⅜	− ¼
27⅛	24	MercantSt	1.40a	8	26	26	25⅞	25⅞	− ⅛
29¼	24½	Merck	.80	90	28	28	27¾	27⅞	− ⅜
112	106⅝	Merck	expf 4	2	109	109	108½	108½	+ ½
93	91	Merck	pf4½	1	91	91	91	91	− 1
54	44⅜	MergenLin	2a	1	51¼	51½	51¼	51¼	− ½
23¾	18⅝	MerrCh&S	1b	45	19¼	19¼	19¼	19¼	− ½
52¼	48	MestaMch	2½a	5	51	51¾	51	51¼	+ ⅛
102	97	MedEd	pf 3.90	z80	97½	97½	97	97	
59¼	47¾	MiamiCop	2a	22	54¾	55¾	54¼	54¼	− ½
47	40⅞	MidlStlPd	3a	12	46	46¾	45¾	46	+ ⅛
142	135⅜	MidlStl	pf8	z50	137	138½	137	138¼	+ 1½
37⅝	30¼	MidwOil	1.40b	62	36½	37¾	36½	37½	+ 2⅜
36⅜	30¼	Miner&Ch	.02d	60	32¼	33⅛	32¾	33½	+ 1⅜
58	19½	MplsHon	.40e	21	75	75	74	74	− 1½
		MplsMol		13	19⅞	19⅞	19¾	19¾	
		MplsM	lpf 5½	z10	80¼	80¼	80¼	80¼	
				1	27	27	27	27	− 1¼

GENERAL REFRACTORIES

NONE... without brick!

That's right—NONE! No sales . . . no profits . . . no financial page . . . no industry. *You* would have nothing to make . . . buy . . . sell . . . or transport were it not for refractory brick.

Because everything made . . . everything that moves owes its very existence to refractories.

Refractories, you see, are born in many shapes and of many compositions to do a variety of jobs. It's brick and high-temperature refractory mortars, plastics, castables, and bulk products that prison temperatures of thousands of degrees for industry.

General Refractories, making and distributing exactly the right refractory to industries everywhere, maintains the world's largest refractories laboratory and draws resources from all over the globe.

A Complete Refractories Service

GENERAL REFRACTORIES COMPANY

Philadelphia 2

A COMPLETE REFRACTORIES SERVICE FOR THE FOUNDRY INDUSTRY

BRIKRAM 80, a high alumina ramming mix, is giving outstanding service in many foundry furnace applications.

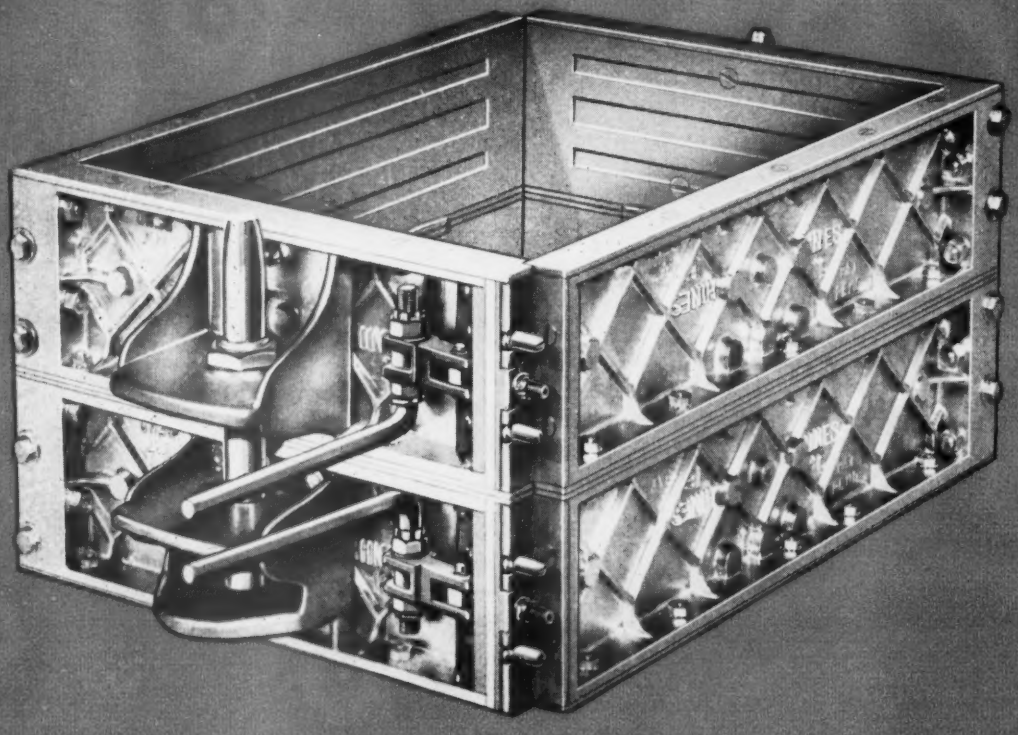
BRIKRAM 80 when rammed in place behind rigid forms, forms an excellent refractory lining wherein temperature and resistance to strong flux or slags are desired. BRIKRAM 80 is used to construct the lower side walls and bottoms of aluminum melting and holding furnaces, center sections of electric furnace roofs and side walls and bottoms of malleable iron furnaces.

BRIKRAM 80, because of its high alumina content, is recommended for use in desulphurizing units where soda ash and other potent fluxes are used. Ladle life can also be increased by using BRIKRAM 80 in the places where the severe wear occurs. In case of ladles holding high temperature stainless steel, or other metals, long service is given by BRIKRAM 80.

For abrasion conditions, HIGH STRENGTH BRIKRAM 80 is available. This material takes a very hard air set and maintains it up to the softening point of the material.

Consult your local GREFCO representative for more complete details of these, and other GREFCO, products.

HINES *announces* ITS NEW

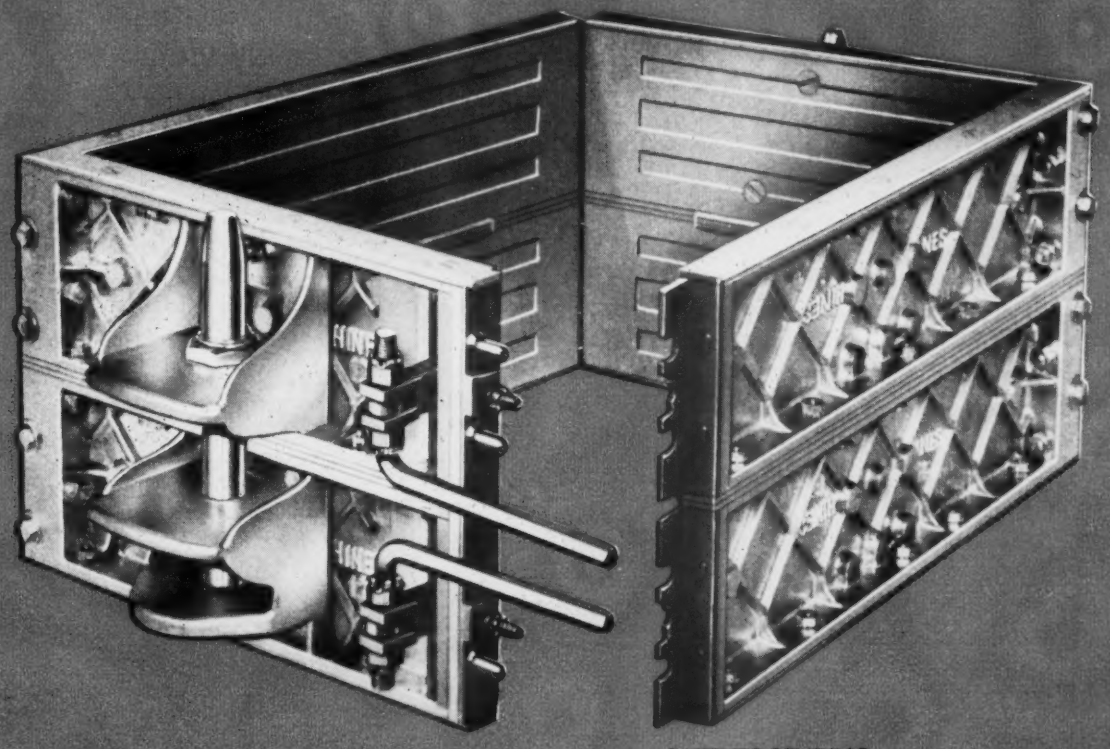


PATENTS PENDING

This new, straight-wall, Hines "HINGE-OFF" flask is recommended for hand and mechanical molding of loose, match plate and cope and drag plate patterns, up to 20″ in length. Made of light weight metal, it maintains alignment because it will not warp from absorbing moisture and drying, as in wood flasks. No wood screws to work loose! Accurate pins and guides and pin center alignment! And, it is provided with a positive, fast-acting, locking mechanism that aligns and locks the open end perfectly and rigidly, to prevent shift!

Maintenance is economical — flask can be repaired and kept in alignment at your own plant. Only one adjustment — tightening the nuts on the locking mechanism. Lengths and widths, 10″ to 20″, in even inches. Cope and drag depths, 3″ to 5½″, in half-inches. Depths over 5½″ are made up in sections. Equipped with Hines standard pins, bushings or guides.

HINGE-OFF FLASK



PATENTS PENDING

This new "HINGE-OFF" flask is being used in our newly developed STACK OR MULTIPLE MOLDING METHOD (Patents Pending). Contact our Main Office for working arrangements and prices.

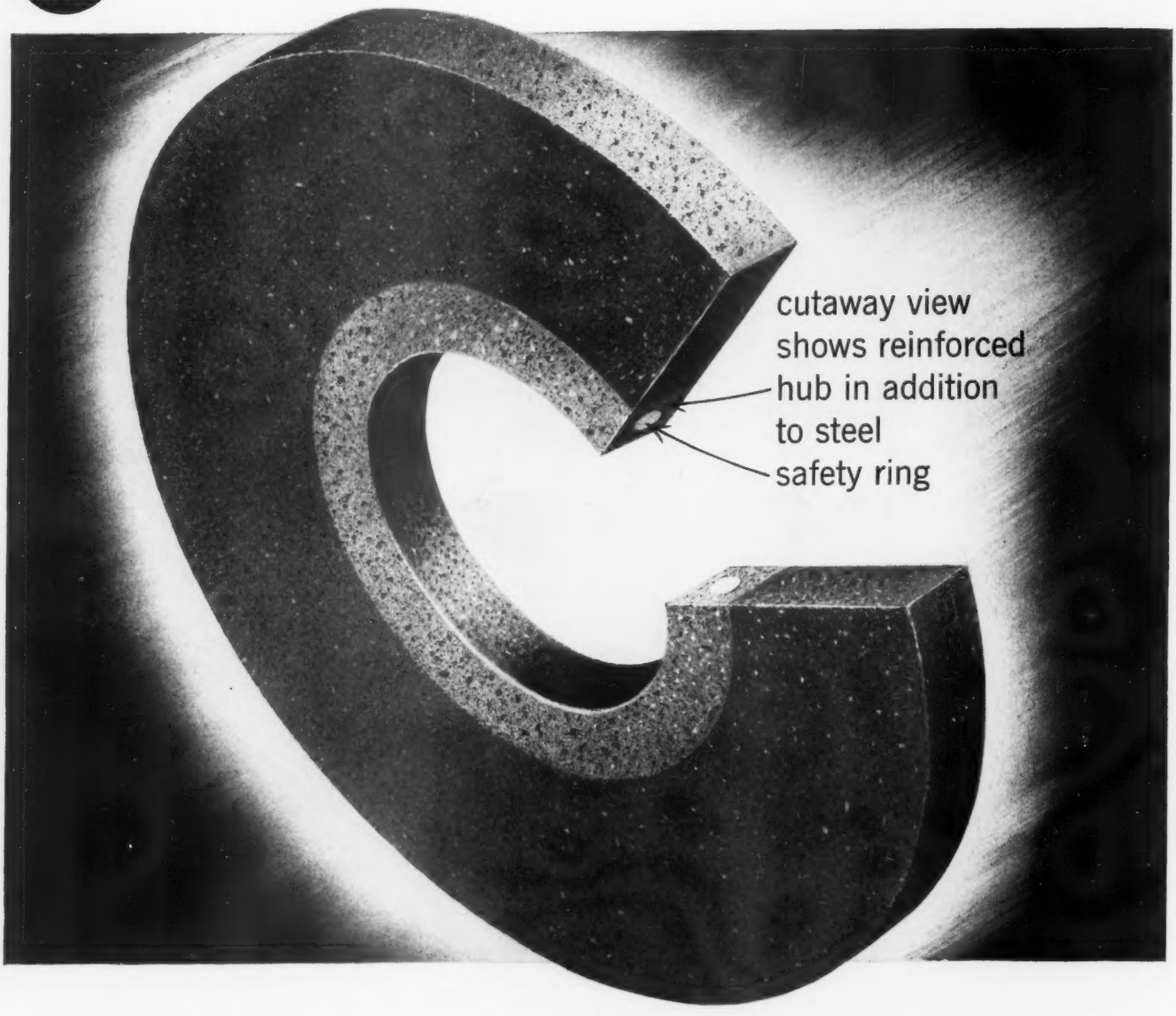
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA INC.

THE HINES FLASK CO.

3431 WEST 140th STREET • CLEVELAND 11, OHIO

For more information, use Reader Service Card, page 229

US RUBBER ROYALITE GRINDING WHEEL



DOUBLY REINFORCED

To Withstand Extreme Stresses

The U.S. Royalite Grinding Wheel is *2-way reinforced* to withstand the great number of stresses concentrated at the wheel hub.

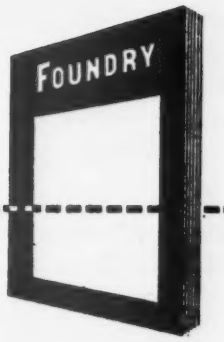
In addition to the steel safety ring, a special reinforcement material is built into the hub of the U.S. Royalite Wheel, enabling it to withstand unusual stress that would break ordinary wheels. This *2-way reinforcement* provides unexcelled safety for grinding service intended.

EXTRA DIVIDEND: U.S. Royalite Grinding Wheels are designed by people who know the problems of foundrymen. When you buy from a "U.S." sales engineer, you are dealing *direct* and are being served by a specialist—a man whose only job is selling and servicing abrasive wheels. He will see that you get top value out of your abrasive wheel dollar. Write Mechanical Goods Division, United States Rubber, Rockefeller Center, New York 20, N. Y.

US RUBBER **Mechanical Goods Division**

United States Rubber

Late News



WHICH WAY BUSINESS?: You can take your choice among the various predictions regarding future business trends. Some people are concerned over the lag in automobile production and home building, tight credit, relatively low farm income and the possibility of a steel strike. Others are heartened by heavy expenditures for public and nonresidential private construction and by industry's plans for substantial expansion and modernization in the future.

The fact remains that industrial activity as a whole has been remarkably stable since last fall. Between September, 1955 and April the Federal Reserve index of total industrial output (1947-49 = 100) varied only between 142 and 144. It has been a case of lags in some directions being offset by gains in other fields. Nevertheless, during the third quarter it seems more likely that the index will dip below its recent range than move above it.

Business survey for May by the National Association of Purchasing Agents says that not since early 1954 have so many branches of business shown a reduction in production and new orders. Regardless of labor developments, steelmaking is expected to dip next quarter. Charles M. White, Republic Steel president, says, however, the rate will not go below 85 per cent and then will recover to near the first quarter pace.

METAL PRICES DIP: Domestic iron and steel scrap prices remain far above levels in effect a year ago but have softened in recent weeks. Heavy melting steel has slipped $4 to $8 a ton since April; cast grades are down as much as $4, and short rails are off $3 to $5. Secondary ingot prices also are lower than a month ago. The reductions range from 1½ to 2¼ cents a pound on brass and bronze to about 4 cents on aluminum.

SCRAP STUDY: In passing approval on a two-year extension of the Export Control Act, the House added an amendment directing the Department of Commerce to survey the domestic supply of iron and steel scrap and present a full report to Congress by next Jan. 31. In effect, this amendment makes mandatory a survey which the Department of Commerce already had indicated it proposed to make.

FOUNDRIES MERGE: Atlas Brass Foundry Co. and Simplex Foundry Co., both of Columbus, O., have merged under the name Atlas Simplex Corp. A modernization program is planned. Atlas produces gray iron and nonferrous castings, while Simplex has specialized in cast aluminum.

ACQUIRES STEEL FOUNDRY: Crucible Steel Casting Co., Cleveland, has been acquired by Consolidated Foundries & Mfg. Corp., Chicago. Consolidated operates a Milwaukee division with the same name, although there was no prior connection between the two foundries. The new property will be conducted as the Cleveland branch of Crucible Steel Castings Co. Division of Consolidated.

REPORT OVERDUE: Copper Division, BDSA, Washington, says that several hundred foundries still have not filed Form BDSAF-325, "Shipments of Copper Controlled Materials 1955." It was due last Feb. 29.

OBITUARY: B. F. Devine, 62, a vice president of Chain Belt Co., Milwaukee, died there May 13 . . . Robert C. Bird, 81, president and treasurer of the former Broadway Iron Foundry, Cambridge, Mass., and a past president of the New England Foundrymen's Association, died May 6 . . . J. H. Sorensen, owner, Columbus Foundry Co., Brooklyn, N. Y., died recently.

SAFETY WINNERS: Malleable foundries which showed the greatest improvement in their safety record last year have been announced by the Malleable Founders' Society. Winners of the society's fifth annual competition are: West Virginia Malleable Iron Co., Point Pleasant, W. Va.; Kirsh Foundry Inc., Beaver Dam, Wis.; Lehigh Inc., Easton, Pa.;

Link-Belt Co., Indianapolis. Lehigh Inc. had no lost-time accidents. Eastern Malleable Iron Co., Wilmington, Del., also was accident-free but was unable to improve on its 1954 record, which likewise was spotless.

TITANIUM PRICE CUT: Titanium sponge metal has been reduced 20 cents a pound to $3.25 by Titanium Metals Corp. of America. This is the fourth price cut during the last 14 months.

CARBUILDING BOOM: April orders for freight cars totaled 6559 units, largest for any month so far this year. Builders had 137,436 cars on order May 1, against 17,930 a year ago.

CHANGES NAME: Warren Foundry & Pipe Corp., with foundries at Everett, Mass., and Phillipsburg, N. J., is changing its name to Shahmoon Industries Inc. S. E. Shahmoon is chairman and president.

PERSONALS: George W. Johnson has been named manager of Vanadium Corp.'s newly unified Steel Foundry and Iron Foundry Divisions. He formerly headed the steel division. Howard H. Wilder, former Iron Foundry Division manager, has been appointed assistant manager of engineering sales . . . Ralph G. Wieland, sales manager, Forest City Foundries Co., Cleveland, has been elected vice president in charge of castings sales and service . . . Robert C. Johnston has succeeded John H. Abbott, retired, as resident manager of the Chicago office, Hickman, Williams & Co.

MISCELLANY: Harry W. Dietert Co., Detroit, has set Aug. 20-22 as dates for its annual Sand School at Detroit Engineering Society . . . Bonham Foundry Co., Bonham, Tex., has been bought by Phil B. Trane, Tulsa, Okla., manufacturer of industrial and oil field equipment, who will operate it under the name of Empire Foundry Co. . . Syracuse Alloy Metals Corp., Manlius, N. Y., is to be sold at auction on June 20 . . . General Refractories Co. plans to build a new basic refractory brick manufacturing plant at Gary, Ind. . . . National Pool Equipment Co. expects to incorporate a brass foundry in a new plant it will build at Florence, Ala., for production of swimming pool fittings and equipment . . . U. S. Electrical Tool Co., Cincinnati, has bought the manufacturing rights, dies, fixtures and inventory of the portable tool line of Bradford Machine Tool Co., Cincinnati.

Prices of Foundry Metals and Coke

(As of May 25, 1956)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.00-17.00
OVEN	
Birmingham	$25.65
Buffalo	27.50
Chicago	27.00
Detroit	27.50
Erie, Pa.	27.50
Indianapolis	26.75
Kearny, N. J.	26.75
Lone Star, Tex.	19.50
Milwaukee	27.50
Montreal, Que.	28.50
Neville Island (Pittsburgh)	26.25
New England, deld.	28.55
Painesville, O.	27.50
Philadelphia	26.50
St. Louis	28.50
St. Paul	26.50
Swedeland, Pa.	26.50
Terre Haute, Ind.	26.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$62.50	$63.00
Birmingham	55.00	59.00
Buffalo	60.50	61.00
Chicago	60.50	60.50
Cleveland	60.50	60.50
Duluth	60.50	60.50
Erie, Pa.	60.50	60.50
Everett, Mass.	62.50	63.00
Fontana, Calif.	68.00	....
Geneva, Utah	60.50	....
Granite City, Ill.	60.90	61.40
Lone Star, Tex.	55.00	....
Neville Island (Pittsburgh)	60.50	60.50
Steelton, Pa.	62.50	63.00
Swedeland, Pa.	62.50	63.00
Toledo, O.	60.50	60.50
Troy, N. Y.	62.50	63.00
Youngstown, O.	....	60.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 40.50; tin bronze, No. 225, 53.50; No. 245, 46.75; high-leaded tin bronze, No. 305, 43.75; No. 1 yellow, No. 405, 31.75; manganese bronze, No. 421, 36.25.

ALUMINUM: 99 per cent plus primary ingots 25.90. Secondary No. 12 alloy 24.75-25.25. Deoxidizing grades: No. 1 25.00-27.00; No. 4 23.00-24.50.

MAGNESIUM: 99.8 per cent notched ingots 34.50, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 46.00 delivered Connecticut valley.

ZINC: High grade 14.85 delivered. Die casting alloy No. 3, 18.00 delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$36.00-37.00	**$48.50-49.50	.....	.....	.....	.....	$62.00-63.00
Boston*	**39.50-40.00	**43.00-43.50	.....	.....	**44.50-45.00	.....	.....
Buffalo	51.00-52.00	**50.00-51.00	.....	.....	**54.00-55.00	.....	64.00-65.00
Chicago	49.00-52.00	47.00-48.00	.....	50.00-51.00	50.00-51.00	61.00-62.00	68.00-70.00
Cincinnati*	**49.00-50.00	**46.00-47.00	**46.00-47.00	.....	**55.00-56.00	.....	**66.00-67.00
Cleveland	49.00-50.00	54.00-55.00	44.00-45.00	54.00-55.00	55.00-56.00	61.00-62.00	68.00-70.50
Detroit*	**46.00	**46.00	**38.00	**51.00	.....	**52.00	.....
Los Angeles	38.00	42.00	.....	.....	.....	.....	.....
New York*	44.00-45.00	44.00-45.00	46.00-47.00	.....	.....	.....	.....
Philadelphia	51.00-52.00	51.00-52.00	54.00	.....	56.00	68.00	.....
Pittsburgh	48.00-49.00	50.00-51.00	46.00-47.00	.....	56.00-57.00	.....	70.00-72.00
St. Louis*	40.00	45.00	35.00	46.00	.....	.....	66.00
San Francisco	40.00	48.00	36.00	48.00	50.00	.....	.....
Seattle	40.00	**40.00-43.00	**37.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

Whitehead's FINE SILICA SANDS

for Fine Finish Castings and Shell Molding

Whitehead offers the widest variety of fine washed and unwashed silica sands . . . all laboratory-tested in a Whitehead laboratory in each of the areas represented.

DIVIDING CREEK, New Jersey
Fine Washed Silica Sands

Retained on Sieve #	Grade D #71	Grade D Special #75	Grade E #96	Grade Overflow #118	Grade Superior #158
30	none	none	none	none	none
40	2.0	1.0	1.0	.2	.2
50	9.8	4.8	7.6	3.2	1.8
70	26.4	14.0	20.4	13.2	4.6
100	41.0	40.2	31.8	29.0	11.2
140	15.0	29.8	17.2	20.2	22.4
200	4.4	8.2	10.8	15.4	25.6
270	.8	1.2	5.6	8.8	14.0
Pan	.6	.8	5.6	10.0	20.2

McCONNELLSVILLE, New York
Fine Unwashed Silica Sands

Retained on Sieve #	#103	#130	#155	#180	#230	#275
30	.3	.2	none	none	none	none
40	.5	.2	.4	"	"	"
50	4.2	.4	1.4	"	.2	"
70	13.6	1.6	3.2	.4	.2	.2
100	26.1	12.4	10.2	2.5	.4	.6
140	25.7	32.8	22.0	18.0	4.0	1.2
200	20.8	37.2	30.0	35.9	21.4	6.4
270	5.5	9.8	14.2	17.4	21.4	11.2
Pan	3.3	5.4	16.8	23.8	46.4	80.4
Very Fine	none	none	1.8	2.0	6.0	

NEW ENGLAND
Marion Fine Washed Silica Sand AFSF #105

Sieve #	Retained
+6	none
12	"
20	"
30	"
40	.6
50	1.4
70	6.0
100	30.6
140	34.4
200	19.2
270	4.6
Pan	3.2

LEADER IN FOUNDRY SANDS SINCE 1841

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

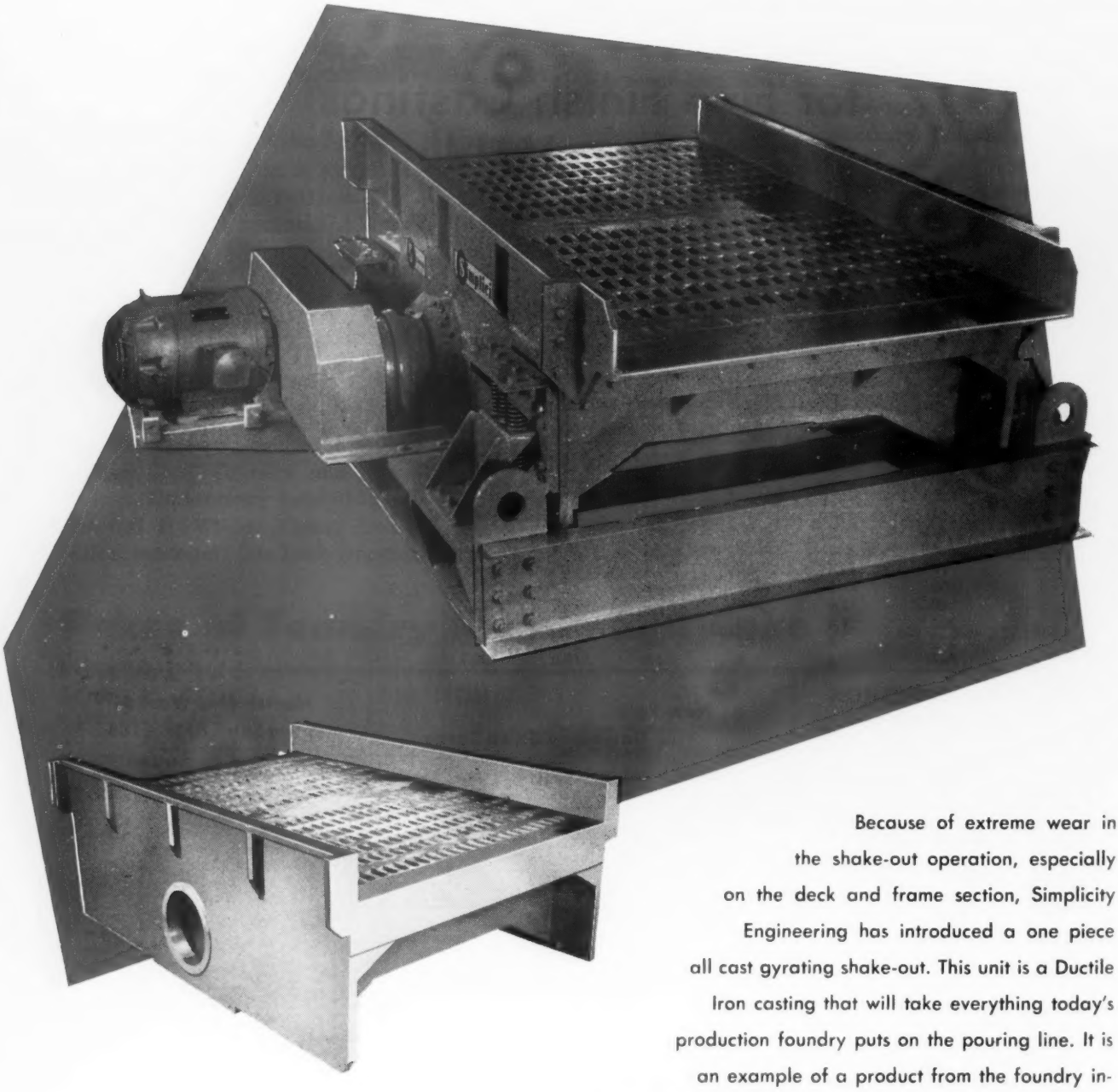
DOB-IT
Ready-to-use core mudding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

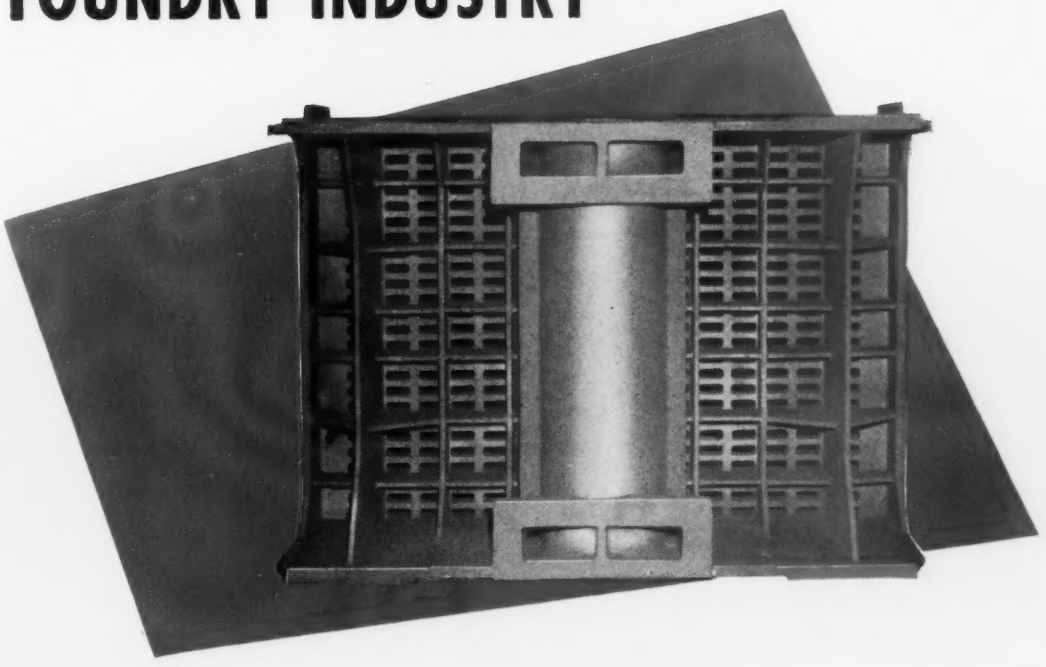
ONE PIECE SIMPLICITY CAST GYRATING AND LOWER MAINTENANCE FOR THE



Because of extreme wear in the shake-out operation, especially on the deck and frame section, Simplicity Engineering has introduced a one piece all cast gyrating shake-out. This unit is a Ductile Iron casting that will take everything today's production foundry puts on the pouring line. It is an example of a product from the foundry industry, for the foundry industry. Cast by The Beloit Foundry Company, Beloit, Wisconsin, it has no rivets or welds, nothing to shear or work apart. Maintenance and wear are at an absolute minimum and this casting makes the all cast shake-out the quietest operating unit in the foundry industry today. This casting, as well as many other cast parts, in all Simplicity shake-outs, makes long life a built-in feature of this equipment. You'll find high performance in any shake-out manufactured by Simplicity, for over 30 years the standard in foundry equipment.

This 4' x 6' all cast shake-out is in operation at a large automotive foundry. The unit is handling 240 head castings per hour at temperatures just below molten. You'll find this punishing schedule an everyday job for thousands of Simplicity shake-outs throughout the foundry Industry.

SHAKE-OUTS MEAN LONGER WEAR FOUNDRY INDUSTRY

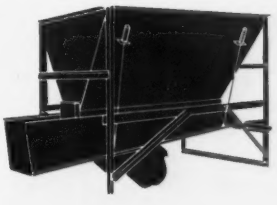


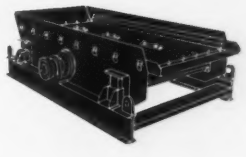
under side view cast shake-out

A view of the under side of the all cast shake-out showing the reinforcing ribs that give this unit extra strength for long, tough operation. Simplicity also recently introduced the use of a one piece cast steel grid, replacing perforated plates on heavy duty fabricated shake-outs. This is another casting application for use in the foundry industry.

Simplicity equipment that speeds production

In addition to Shake-Outs, Simplicity also supplies the foundry industry with many other widely-used types of equipment, including screens, feeders, conveyors, lump crushers, and sand conditioning units • Simplicity Sand Screens help produce better castings by eliminating particles of coke, rock, shot, and other such impurities from your molding sand • Simplicity Gyrating Screens also help to open up, fluff, and aerate the sand, and to improve grain distribution • Simplicity Os-A-Veyor Feeders are ideal for delivering a controlled flow of material, either on a continuous basis, or in predetermined amounts • Bin-hung Os-A-Veyor Feeders will measure coke occurately into charge buckets for the cupola, and other bin-hung or main-frame-supported units are extensively used for conveying sand and limestone • Also available are single, double, and heavy-duty pan conveyors for sand, and grid-deck conveyors for castings • Simplicity Lump Crushing units and Sand Conditioning equipment are valuable additions to any foundry . . . assuring the proper sand permeability which is so important to good molding • All Simplicity equipment is designed for hard wear and long service. Send for our catalog or for any specific information you may need.





Simplicity
TRADE MARK REGISTERED
ENGINEERING COMPANY • DURAND 7, MICHIGAN

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.

FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario

FOR EXPORT: Brown and Sites, 50 Church St., New York 7, N. Y.

CHAPLETS

Foundrymen have learned there will be no spoiled castings due to faulty Chaplets if they standardize on Shanafelt 'Seal-Tytes.'

Materials are metallurgically correct for thorough fusing in the casting. Uniformity in size of heads and stems is maintained by careful inspection. A full metallic coating keeps them rust proof while in your stock bins.

We specialize in double heads and keep large stocks of most sizes for immediate delivery.

STEEL FLASKS

For 35 years Shanafelt steel Flasks have been helping foundries pour good castings.

The Shanafelt Flask is strong, accurate, and long wearing, yet light in weight for easy handling.

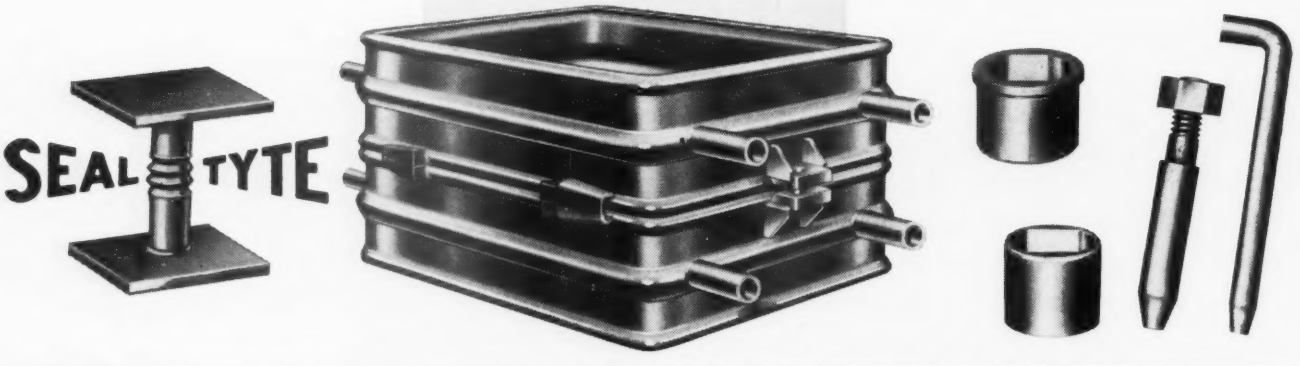
If you have never used Shanafelt Flasks, it will pay you to give them a trial—see for yourself how well they perform under your own production conditions.

FLASK PINS AND BUSHINGS

Shanafelt hardened steel Pins and Bushings are made for smooth and fast line up of the Flask sections.

Many years of Flask experience have taught us how they must be made to deliver results under today's high speed foundry operations.

Regardless of what Flask you are using, you'll make no mistake replacing worn bushings and pins with precision-made Shanafelts.

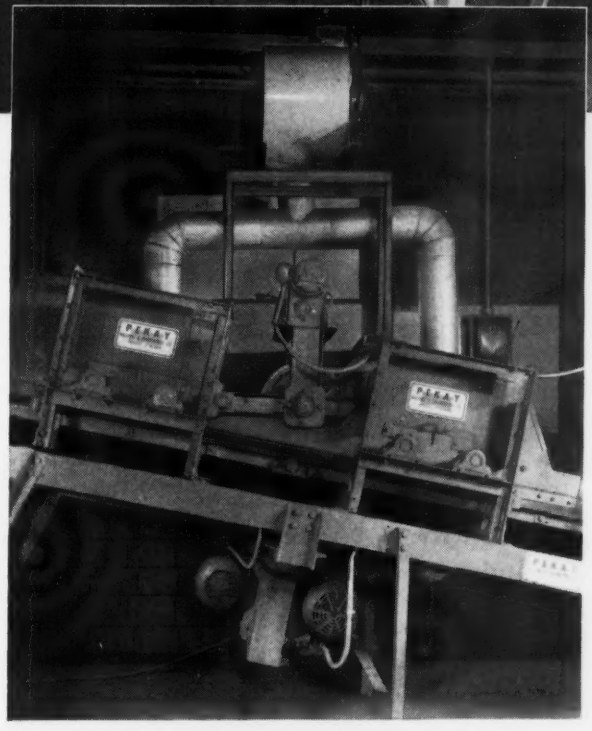


Dependable **SHANAFELT** *Products*

SERVING THE FOUNDRY INDUSTRY FOR OVER 63 YEARS . . . . .

THE SHANAFELT MANUFACTURING CO., CANTON, OHIO

2600-2700 WINFIELD WAY N. E.



PEKAY

MINIMUL

MULLER & CONVEYOR

Installation in STERNAMAN FOUNDRY, INC., Springfield, Illinois.

New Approach to Real ECONOMY in Sand Conditioning . . . . .

Here's how to get better conditioned sand on lower volume operations, and do it economically! This PEKAY MINIMUL Muller & Conveyor combination is designed especially for this need. It features the same efficient mulling methods, and the same rugged construction, which have made PEKAY's standard-size Mixer-Muller so successful in foundries throughout the country—but size, weight and *cost* have been scaled down.

MINIMUL is highly flexible, too. We can make almost any desired modification in size and weight, to fit your particular needs. Unit length can be as short as 15 feet—weight as little as 5000 pounds. And installation is easy and quick; in fact, MINIMUL can be supplied either as a permanent installation or in portable form. MINIMUL is an intact machine; sand fed directly onto the belt is thoroughly mulled and comes back directly onto the belt at the other end, so that good production speed can be maintained.

For supplementary low volume or "custom-line" operations, MINIMUL is precisely the sand-conditioning equipment you have been looking for, combining high operating efficiency with *real economy*, both in initial price and in low maintenance costs. It can be a real "pay-off investment" in *your* foundry!

SEND FOR COMPLETE DETAILS TODAY!

Specialists in Foundry Sand-Handling Engineering & Equipment

PEKAY MACHINE & ENGINEERING CO. INC.

871 N. SANGAMON STREET CHICAGO 22, ILLINOIS

M-T-MATIC Elevator Conveyor Buckets
TROFF-O-MATIC Conveyors

Gentlemen:

Please send me details and price information on the PEKAY MINIMUL

NAME _____ TITLE _____

COMPANY _____

STREET & NO. _____ CITY _____ ZONE _____ STATE _____

DELTA
FAST-DRI
LIQUID RESIN BINDERS

FOR

FASTER PRODUCTION OF BETTER CORES

at lower cost!

Cores made with DELTA 155-X and 168-X FAST-DRI Liquid Resins have 1) — an unusually high tensile strength (20% greater than linseed oil), 2) — a lower gas ratio, 3) — a higher degree of elasticity, 4) — less core embrittlement and 5) — greater surface core hardness.

Core sand mixes made with DELTA FAST-DRI Liquid Resin binders have excellent flowability resulting in denser cores and better workability in core boxes.

The uniformity of DELTA 155-X and 168-X FAST-DRI Liquid Resin binders is guaranteed. The chemical and physical constants are maintained by strict laboratory control.

Get the facts...

Working samples for test purposes together with complete data are available to you. Included, also, will be information on other Delta Core Oils, Delta Dri-Bond and Delta Bondite. Your request will receive immediate attention.

DELTA

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

*Get a **REAL** lift—*

see the all-new Clarklift "Leadership Line"

Now, after three years and thousands of engineering and test hours, here is the best design, the most serviceability, the safest and finest performance ever built into one lift truck.

For easy servicing, see how the *entire* hood folds back. Look at the miracle of a longer wheel base in the same over-all length; tighter turning radius too.

Lifting speeds are increased 50% . There's more engine power. Gradeability and tractive effort are increased, yet control of movement is more precise than ever.

Safety? Comfort? Look at the dead man brake, simplified directional controls, extra-wide adjustable seat, less braking effort, and easy steering.

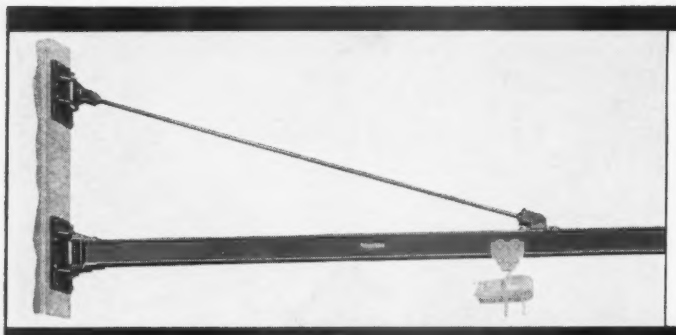
That's just the beginning. This is a completely new truck with dozens of new ideas . . . ideas you wanted in the *ideal* lift truck. Soon your dealer can show them in models ranging from two to five thousand pounds. See him . . . you'll get a real lift.

CLARK® EQUIPMENT

Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek 16, Michigan

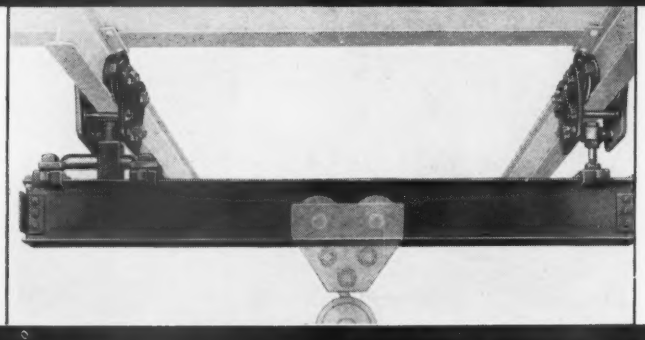
For more information, use Reader Service Card, page 229

The solution to your foundry problems often hang on ONE of R-W's BIG 3



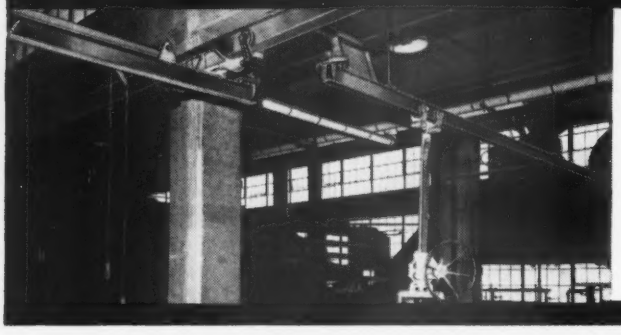
R-W 939
Swinging Jib Crane

. . . is most commonly used with the rod support (above), but is also available with curved track for supporting outer end of boom. Available in a wide variety of sizes with capacities up to 4000-lbs.



R-W 971
Flexible Traveling Crane

. . . yoke and cross head are self-adjusting to variations in track span . . . crane cannot bind because bridge need not maintain right angles to tracks. Available in many sizes with capacities up to 8000-lbs.



R-W 3900 Series Tru-Tred
Crane and Monorail

. . . combines ladle handling with maximum smoothness and safety, plus 100% utilization of pouring floor area. Transfer crane with safety interlocks at transfer points provides utmost flexibility and easy handling throughout pouring operations.

. . . quality engineered for precise performance!

Today's featured performers in many modern foundries, are Richards-Wilcox cranes and Monorail conveyors. That's because these material handling systems are scientifically engineered to cut costs, break bottlenecks, speed production—while operating with safety and efficiency at low cost.

Your problem—whether it involves a single unit for a particular handling step, or a complete system for your overall operation—can often be solved *best*, with economical Richards-Wilcox equipment.

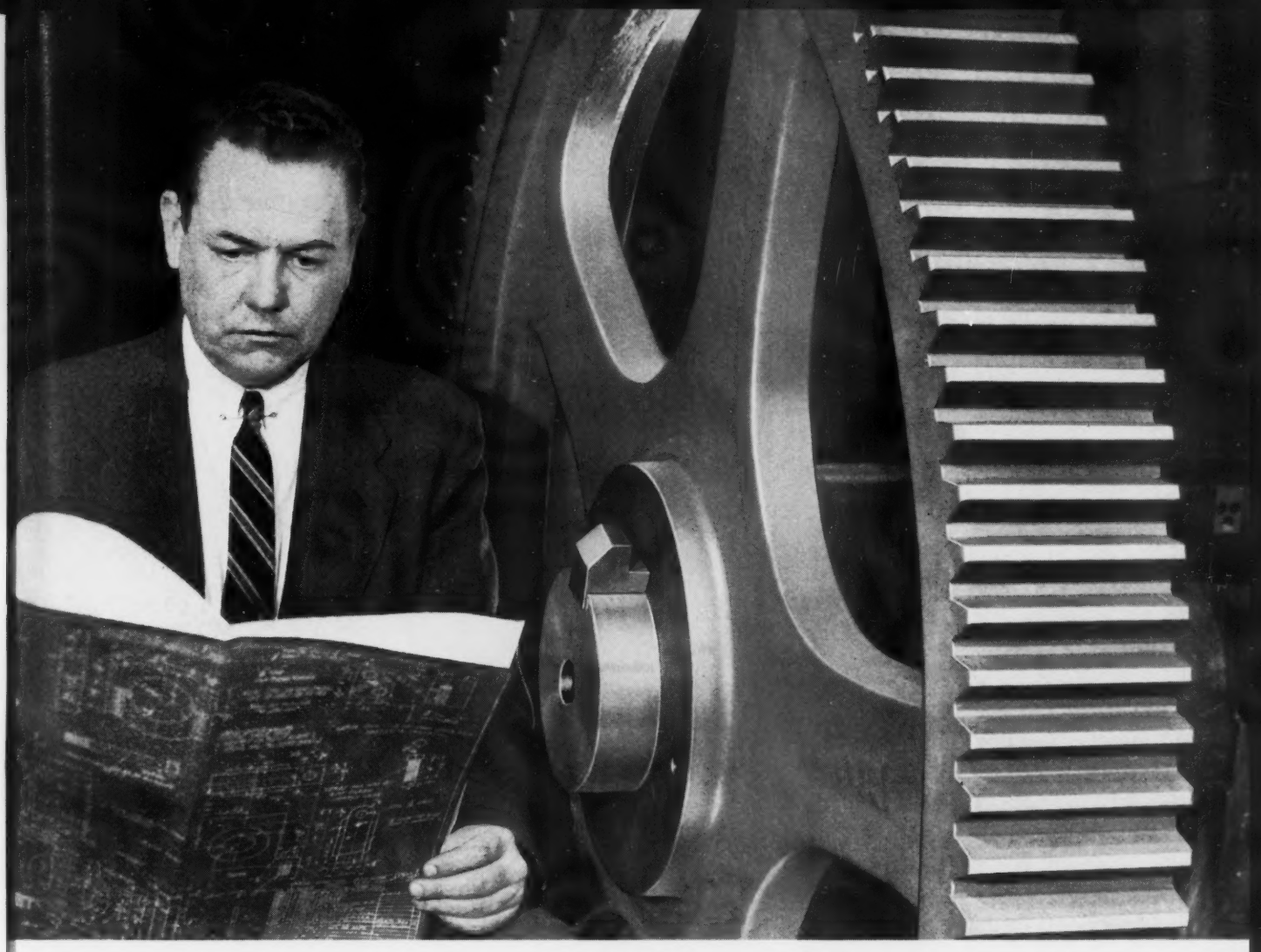
See R-W Equipment Displayed at Booth 402 · Materials Handling Show · Cleveland Auditorium, June 6-8

Why not lay your foundry material handling problems before a Richards-Wilcox engineer today. He can show you, without cost or obligation, how to effect remarkable savings in time, money and maintenance.

Richards-Wilcox
MANUFACTURING COMPANY
Materials Handling Division

466 W. THIRD STREET, AURORA, ILLINOIS • Branches in Principal Cities

SLIDING DOOR HANGERS & TRACK • ELECTRIC DOOR OPERATORS • FIRE DOORS & FIXTURES • INDUSTRIAL DOORS & EQUIPMENT • INDUSTRIAL CONVEYORS & CRANES SCHOOL WARDROBES & PARTITIONS



The gears in an automatic nut former have to be tough and strong to withstand heavy, varying loads. Yet, the castings from which they're made should be easy to machine. That's why this gear for a Waterbury Farrell Automatic Nut Former is made from ASTM-50 gray iron with a nominal composition of 1% nickel and .50% molybdenum.

Moly gives cast iron gears higher strength with toughness and good machinability

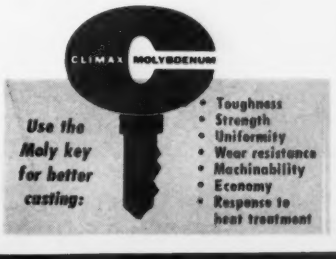
"To insure a tough, easily machined gray iron for the gears in our Automatic Nut Formers," says Henry C. Griggs, Metallurgist for Waterbury Farrell Foundry & Machine Co., "we specify .50% molybdenum in our ASTM-50 material. The properties of this material contribute importantly to the reputation of Waterbury equipment for accuracy and high speed production under severe operating conditions."

Molybdenum helps to give reliable and reproducible castings – very important factors in consistent performance of gears.

Investigate moly irons. They may be the key to better performance in many of your gear applications.

For the first two in a series of bulletins, "Why Moly Iron," or for technical assistance, write Climax Molybdenum Co., Department 20, New York 36, N. Y.

CLIMAX MOLYBDENUM



THE VERSATILE S

This is the two station indexing type molding machine you saw in actual automatic operation at the A.F.S. Show. If you missed it we can arrange for you to see it operating in a customer plant.

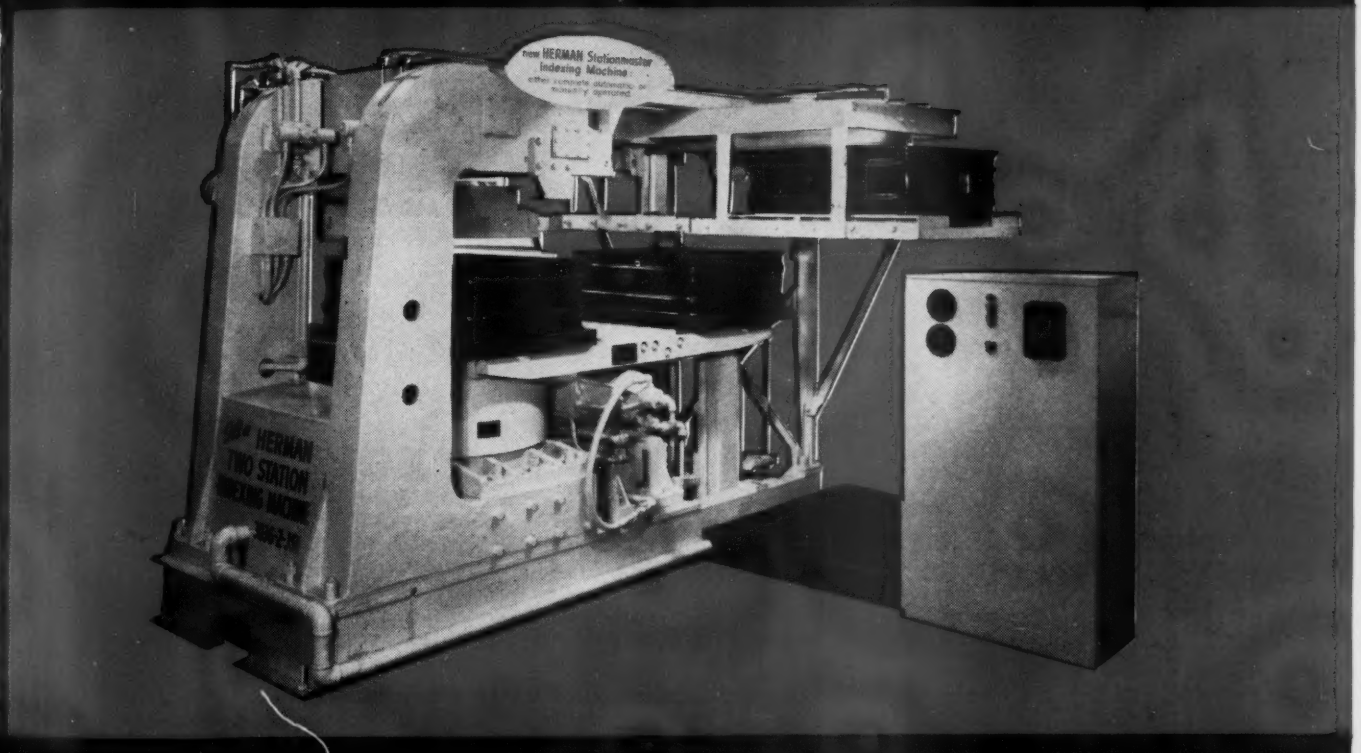
FEATURES: (1) Proper jolt insured by adjustable Bunter Control Valve and Timing Device. (2) Squeeze pressures adjustable to a maximum. (3) Adjustable strike-off bar. (4) Retractable squeeze heads permit direct sand filling through variable sand hoppers mounted on squeeze head supports. (5) Squeeze piston provided with limit stop. (6) Adequate registrations insure accurate location of flask at all positions. (7) Jolting, squeezing pneumatically operated. (8) Other operations controlled by proven pneumatic hydraulic application to insure fast, smooth, positive action.

Automatic, semi-automatic or manual control.

Additional details available by asking for bulletin No. JSI-4-56.

THE HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

E STATIONMASTER



FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN

Best Known Name in Molding Machines

NEW!

NEW!

NEW!

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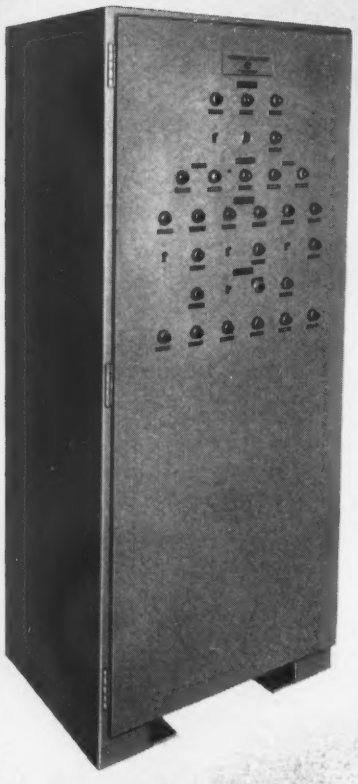
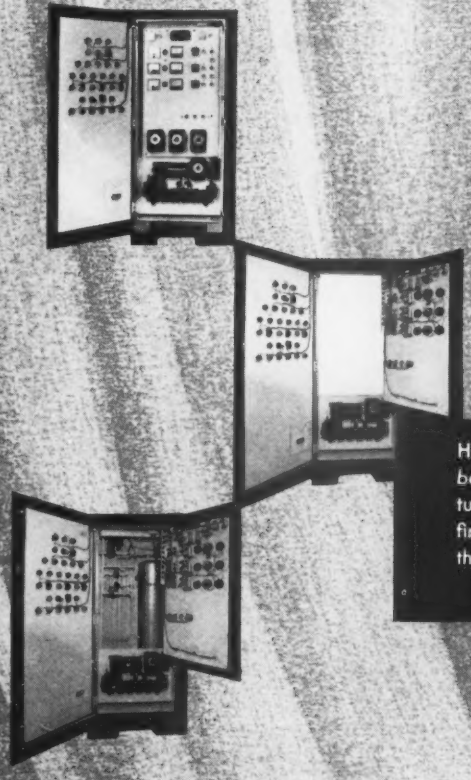


the *NEW* HARTLEY HYGRO-GUIDE

SERIES XI

brings the modern foundry these advantages—

- **Automatically and accurately controls sand moisture**
- **Increases sand production**
- **Improves casting finish**
- **Reduces scrap**



Here's the revolutionary method of controlling sand moisture *while the sand is being mixed!* Sensing probe installed in the mixer determines existing temperature and moisture as sand is blended. Water is added in three stages to bring final moisture content to the exact *level* desired. This is all accomplished during the normal mulling cycle . . . *there is no increase in mulling time!*

Complete information sent upon request

HAYLCO CONTROLS *Corporation*

NEENAH, WISCONSIN

NEW CONVEYOR BELT IDLER

Handles sticky, abrasive, dusty, or corrosive materials.

Has only two bearings—up out of the dirt.

A 2-bearing, cable suspension idler that resists dust, abrasion, corrosion and material buildup is proving itself superior for bulk handling in many industries.

Called the Limberoller, it has already given *11 times* the service life of replaced steel idlers in handling abrasive foundry sands, coal, petroleum coke, potash, copper ores, copper mill tailings, iron ore, wet concrete, triple super-phosphate, ammonium sulphate, and sticky fertilizers.

Pressure-molded neoprene or rubber discs on a flexible steel cable conform to load and cushion the belt, help keep belt aligned, and are self-cleaning. The two bearings are up out of the dirt zone; have had no design failures.

Unaffected by most corrosives that damage steel, the new idler is ideal for chemical, sulphur and salt plants; corrosive and high ozone atmospheres. It is more abrasive-resistant than steel and flexes out of the way of abrasive materials.

The Limberoller weighs ⅔ less than a conventional steel idler; is locked by a simple cotter key into special lightweight stands for easy installation and removal. No cover sheets are needed. Two types of stands are available: one that bolts to conventional rigid sections; and a self-supporting type that forms its own easily-erected portable sections without bolts, by using special stiffening rails.

Because of these unique features, many companies have adopted Limberollers as standard for all belt conveyor operations. Details from *Joy Mfg. Co., Oliver Bldg., Pittsburgh 22, Pa. Request Bulletin* 82-13

WSW † 6051-82

Harry –
This is that new belt conveyor idler I was raving about the other day.
E.J.W.

"No bump" feature eliminates segregation of wet concrete mix on belts (and permits wider spacing of idlers

Triple Super Phosphate DOES NOT BUILD UP ON LIMBERROLLER ROLLS! (Builds up 2" thick, with jagged edges on steel rolls - requiring constant work by men with hammers + chisels to try and keep it down.

Excellent too for quarries concrete batch plants; coal metal and non-metallic mines; foundries; coke plants

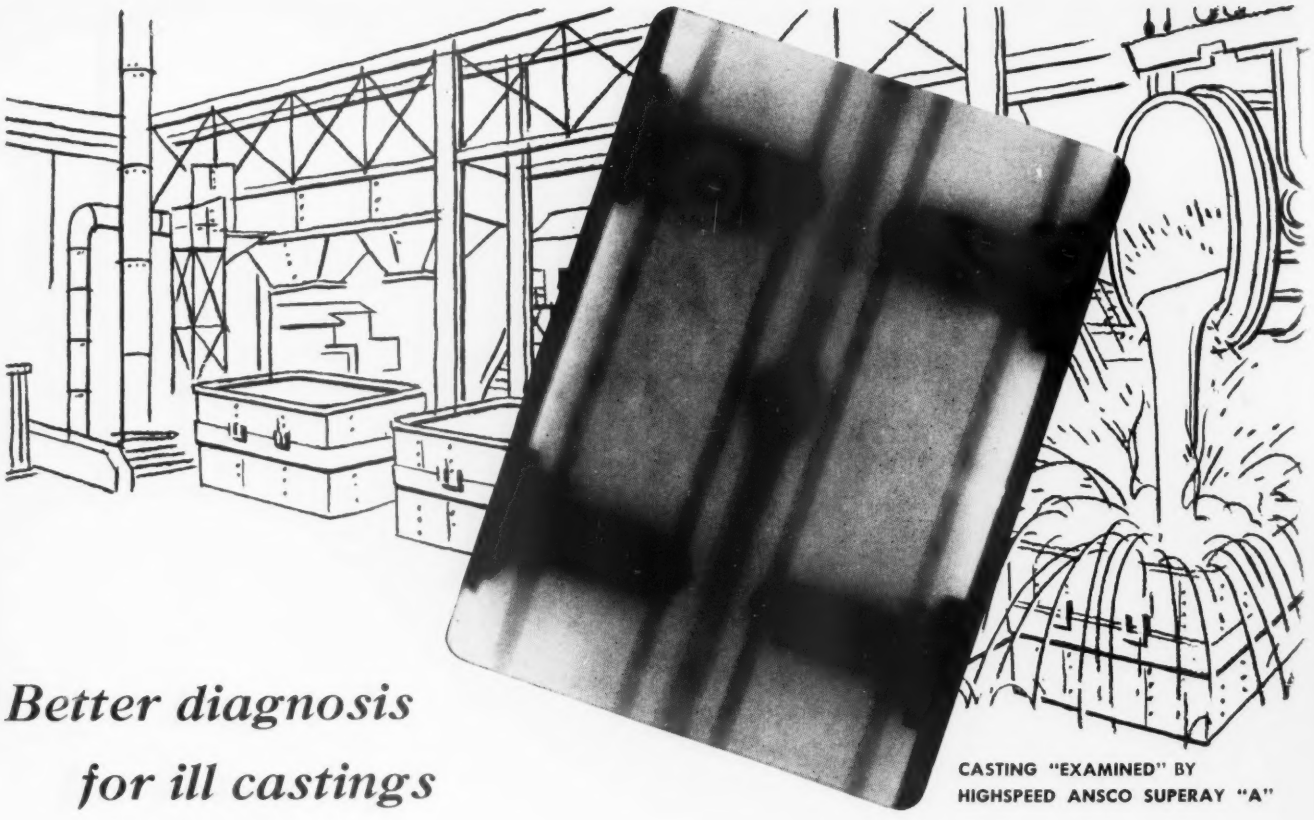
Available for belt widths of 18" to 42"

Swell for "hard-to-get-at" locations

2½ years on foundry handling abrasive foundry sand with NO DOWN TIME! still going strong with little sign of wear (former idler life 3 months)

Neoprene will not support combustion is grease resistant Rubber is less expensive - better for extreme cold weather

Can even be put in or taken out while Belt is moving



CASTING "EXAMINED" BY HIGHSPEED ANSCO SUPERAY "A"

Better diagnosis for ill castings

Ansco watches over quality for industry

THE RIGHT FILM FOR EVERY X-RAY NEED:

SUPERAY "A"
Versatile! A "workhorse" film!

SUPERAY "B"
Resolving power for research!

SUPERAY "C"
High-speed for production-line inspection.

THE RIGHT CHEMICALS FOR PERFECT PROCESSING RESULTS:
Liquadol, Liquadol Replenisher, Liquafix

It was exciting to start with—the technique known as radiography! In a scant few years, it revolutionized quality control. But, when Ansco created the first films tailored especially for industry, X-ray accuracy reached a new pinnacle.

Today, Ansco Superay "A" film can guarantee uniform casting quality right in your foundry swiftly, non-destructively! It can bring you dramatic savings in testing costs, time and labor. It can help you establish a mold and pouring practice.

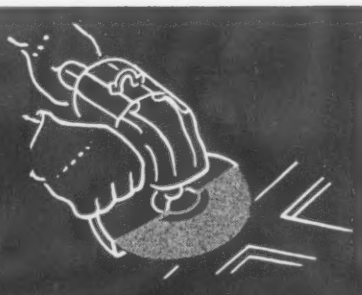
Are you broadening your use of radiography? Or establishing it for the first time? Ansco films and chemicals are backed by over a century of skill, by exhaustive chemical research, by experience on a broad variety of accounts (serviced, always, on a personal basis). Let Ansco watch over your quality!

America's oldest maker of photographic materials . . . Ansco

For better safer grinding

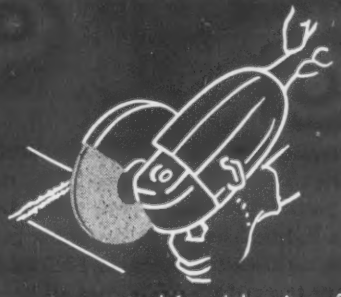
SIMONDS ABRASIVE CO.

Reinforced Resinoid Bonded ABRASIVE WHEELS

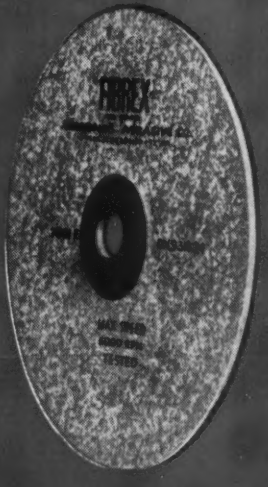


SIMEX®
RED WHEEL

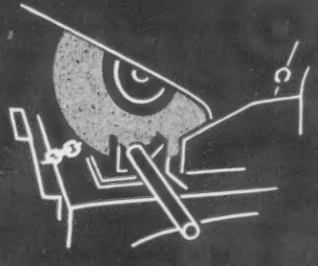
Save time and money on weld grinding with SIMEX . . . lightweight, rigid, for heavy duty use. Structurally different—with auto tire cord safety web backing! Send for Bulletin ESA-244.



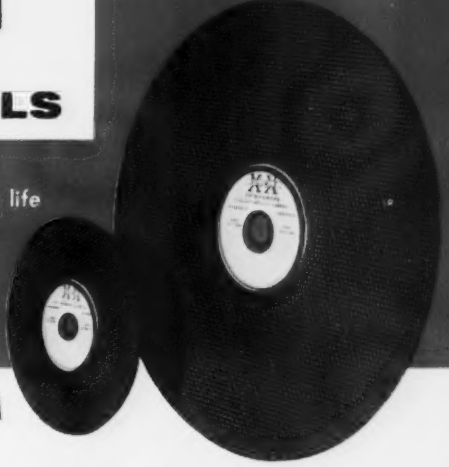
FIBREX®
RED CENTER WHEELS



Ideal for deburring, finishing, polishing and cutting-off. Slightly flexible for general offhand use and the lighter weld grinding jobs. Extra strong and fast cutting. Send for Bulletin ESA-244.



DOUBLE XX
CUT-OFF WHEELS



Glass fiber reinforced for extra strength, less breakage and long life
Fast cutting on all types of metals and non-metals.
Send for Bulletin ESA-243.

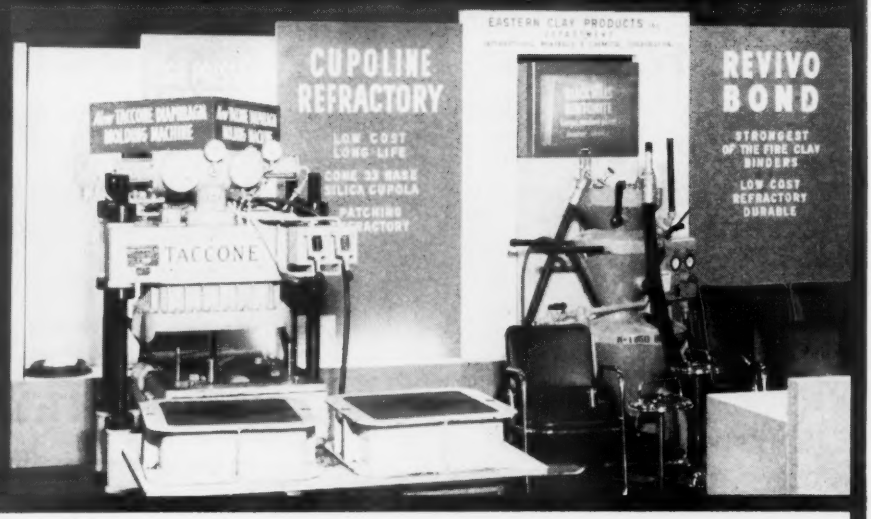
SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities
Division of Simonds Saw and Steel Co., Fitchburg, Mass.

LET'S KICK IT AROUND

BY TOM BARLOW, EASTERN CLAY PRODUCTS DEPT., INTERNATIONAL MINERALS & CHEMICAL CORPORATION

HOW MUCH DOES MOLD-WALL MOVEMENT COST YOU?



The 1956 Convention is over—and I'm almost over the 1956 Convention. While recuperating, let's reminisce. Of course, I'm biased because I was in sand sessions and Booth 1822 playing with Plasti-Bond, DonCO_2 Binder, and Taccone Molding Machines. However, it seems like the main topic of conversation in Atlantic City was mold-wall movement (by one name or another). There were many sessions on precision or more precise castings. Some talks, such as shell and CO_2, stressed the use of cured molds to stop mold-wall movement. Other sessions covered various methods of getting density and mold hardness in green sand. High pressure squeeze, heavier jolting and sand flowability all came in for discussion.

Is all this interest in mold-wall movement confined to the "fancy" stuff or is it a practical tool for practical foundry operation?

Let's be cold-blooded about the whole thing and see only the results that effect foundry costs and profits. Does all this yak have a practical significance or is it only a new fad?

We don't have to look any further than our own foundry records on yield. Yield is money. For example, a casting made on a Taccone Machine in Plasti-Bond sand weighs 25 pounds (plus or minus a few ounces). It is sound and free from shrinks with nine pounds of gate and riser. The yield is 73.5%. Before controlling mold-wall movement, the casting weight ranged from 26 pounds to 30 pounds. The gate and riser weighed 14 pounds. The yield of saleable casting was 53% (the customer only paid for a 25 pound casting). In addition, the overweight had to be machined off with a rough cut before the casting could be accurately jigged for final machining. By controlling mold-wall movement, we increased the foundry yield by 16%—and saved the customer one machining operation. An ordinary casting was involved—nothing fancy or reengineered. Just plain old fashioned horse-sense. (That's the sense horses have that keeps them from betting on people.)

The saving in weight alone is a lot. The customer always buys castings on a piece price. (You may think you sell on a pound price but if your competitor consistently ships a lighter casting at the same price per pound, he will soon have the business.) However, even more important to you is the fact that all excess weight on a casting must be fed! Don't forget that mold-wall movement usually takes place *after* you finish pouring. Therefore, the extra weight must be in the riser, ready and waiting to finish filling the mold cavity.

When the casting is five pounds overweight, the riser must also be overweight to feed the larger casting. Copes must be higher to make sure it feeds. You can't put just five pounds of metal in risers and expect them to feed out completely. There is a loss of efficiency due to freezing of the walls of the riser, etc. You may have to add 10 pounds of riser to feed a five pound mold-wall movement.

Ignore the sales appeal of a better looking casting and cheaper machining if you can. But can you ignore your own yield? Stop mold-wall movement and reduce your gates and risers if you want to see how much mold-wall movement is costing you.

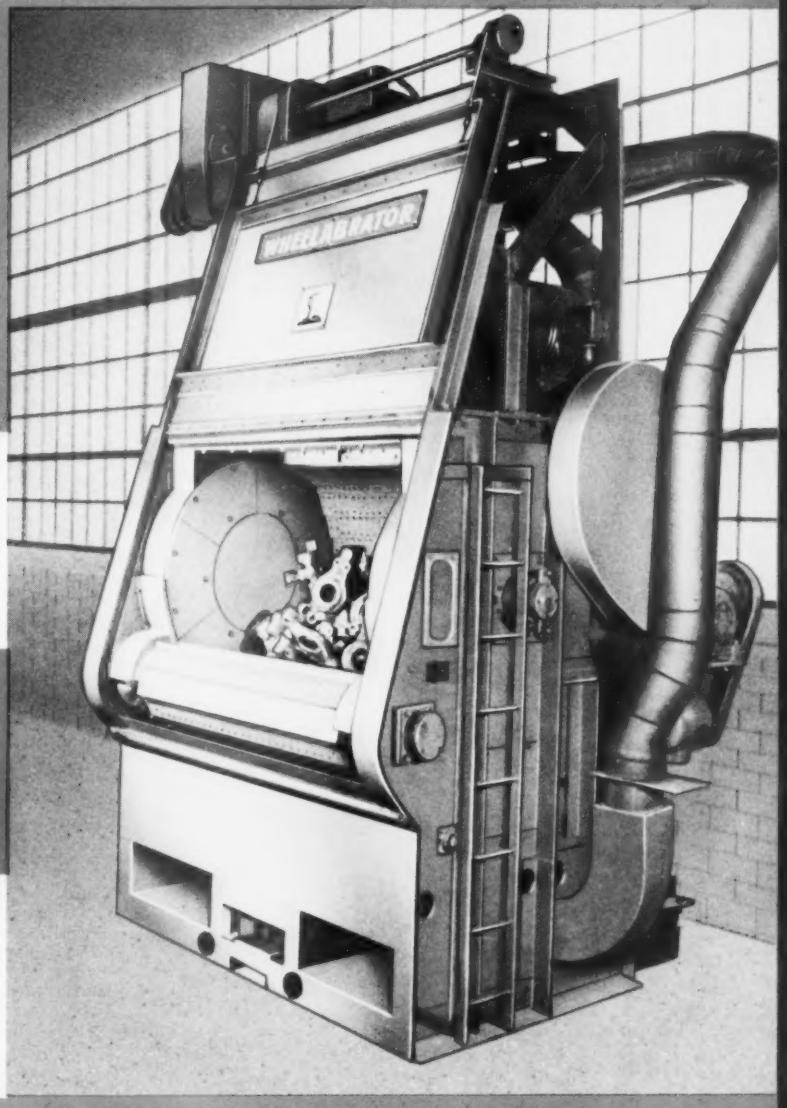
Taccone Molding Machines, Plasti-Bond and DonCO_2 may not be the only way to stop mold-wall movement, but our literature is real attractive. Why not write for some?

A BIG HIT
at the Foundry Show
A BIGGER HIT IN ACTUAL USE

WHEELABRATOR®

SUPER TUMBLAST

Proven SUPER SAVINGS IN OPERATING COSTS through Field Tests in Plants like these



At Unitcast Corp.

Operated over 6 weeks without wearing out a single part. Saves abrasive, cleaning time, man-hours.

At Dayton Malleable Iron Co.
(Ironton Division)

Provides quality cleaning with maintenance, abrasive and labor savings.

At Indiana Forge & Machine Co.

Cleans twice as much work in half the time . . . automatically.

See back page for additional details.

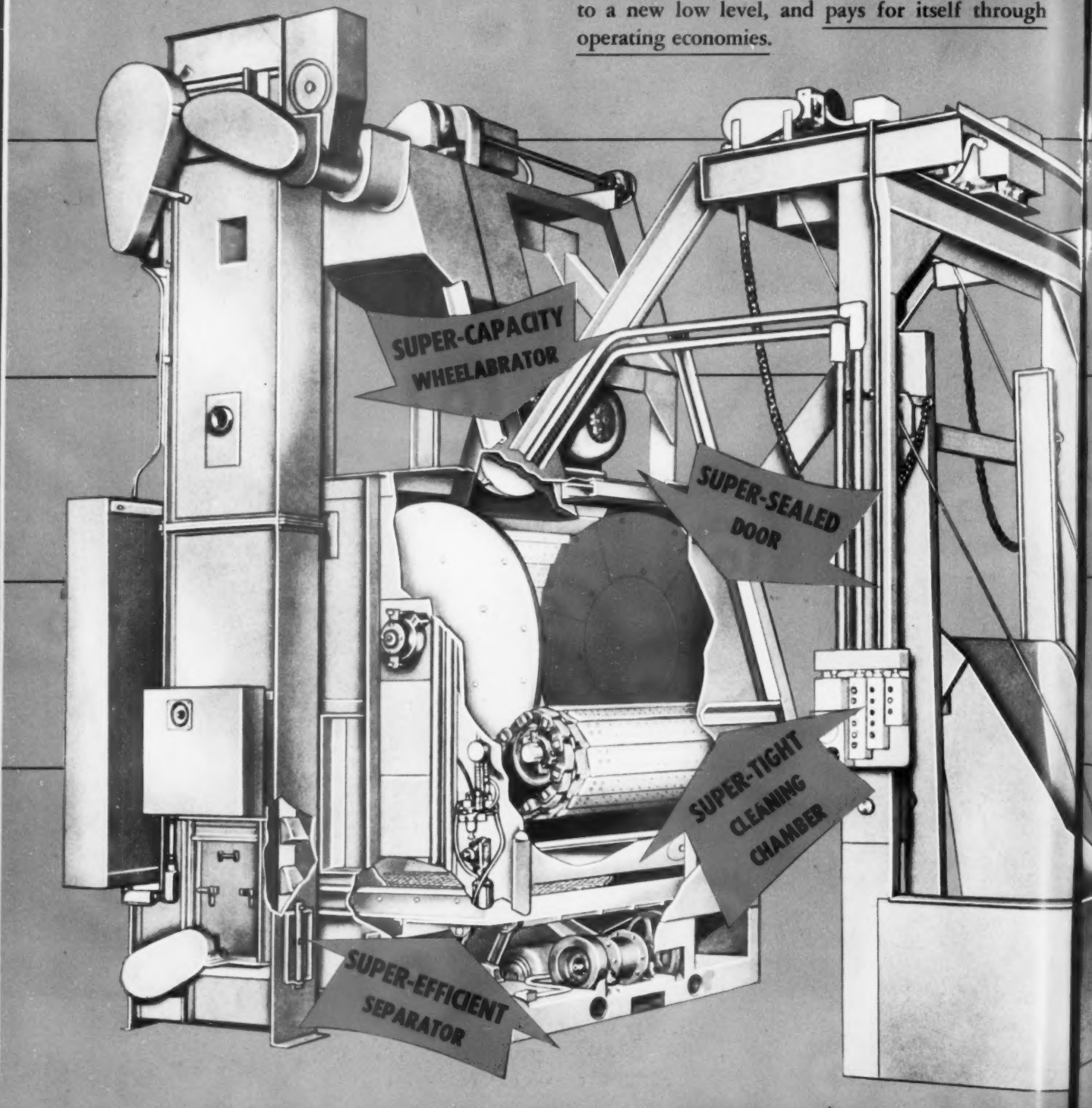
WHEELABRATOR
CORPORATION
505 S. Byrkit Street, Mishawaka, Indiana

WHEELABRATOR®

SUPER TUMBLAST

Pays for Itself Through Super-

The Super Tumblast is the modern day answer to high priced cleaning costs. It is specifically designed to give you more mileage out of your blast equipment and more profit out of your Cleaning Department. The Super Tumblast is engineered throughout for maximum productivity and maintenance-free operation over extended periods of time. Its trouble-free operation lends itself to automated operation but, whether automatic or manual, the Super Tumblast reduces cleaning costs to a new low level, and pays for itself through operating economies.



Savings in Operating Costs

New SUPER-CAPACITY Wheel throws more than twice the abrasive . . . is easier to service

The New Super-Capacity Wheel throws more than twice as much abrasive as any similar sized wheel previously used. Less power is required per pound of abrasive thrown. The blast pattern is spread over the entire blast chamber in a more uniform manner, providing faster, more uniform cleaning. The wheel has new Long-Lyfe Blades, a strain-free blade holding device, a new easy-service wheel guard housing, and a new system of Long-Lyfe wheel guard liners, all designed to reduce maintenance to a minimum.

New SUPER-EFFICIENT Separator saves wearables and abrasives

The New Super-Efficient Abrasive Separator is perhaps the greatest single cost-saving feature of the machine because it affects so many areas. It increases cleaning efficiency and speed by maintaining the optimum abrasive mixture throughout the blast cycle. It removes sand and scale in the heaviest concentration without removing abrasive particles until they are too small for use. By removing highly-abradant contaminants with so much greater efficiency the Super Separator eliminates a major cause of machine wear.

New SUPER-TIGHT Cleaning Chamber eliminates jamming of work

This is the tightest steel flight conveyor ever used in blast equipment. There are no open spaces where even the smallest work can get caught and damaged . . . and there are no areas where work can jam and displace liners, interfere with the operation of the door, or break the abrasive-tight seal on the machine. This reduces downtime to a minimum.

New SUPER-SEALED Door prevents abrasive loss

The New Super-Sealed Door keeps all abrasive in the machine and provides trouble-free operation on any type of work. The power-operated one-piece door will withstand impacts from both inside and outside the mill. It travels in tracks that are integral with the side frames of the machine. The abrasive seal formed by these tracks is as strong as the basic structure of the machine. The door is reinforced to prevent jamming or warping.

LONG-LYFE Parts throughout have 25 to 50 times longer life

Every high-wear point within the Super Tumblast is equipped with Wheelabrator Long-Lyfe Parts. These parts are made of a patented alloy steel fully heat treated for maximum possible wearable life. They last many times longer than ordinary parts to save hours in replacement time, machine downtime, ordering and handling time.

WHEELABRATOR
CORPORATION

These SUPER TUMBLAST installations Produce SUPER SAVINGS in Cleaning Cost: Through Increased Productivity and Automation

At
UNITCAST CORP.
Toledo, Ohio

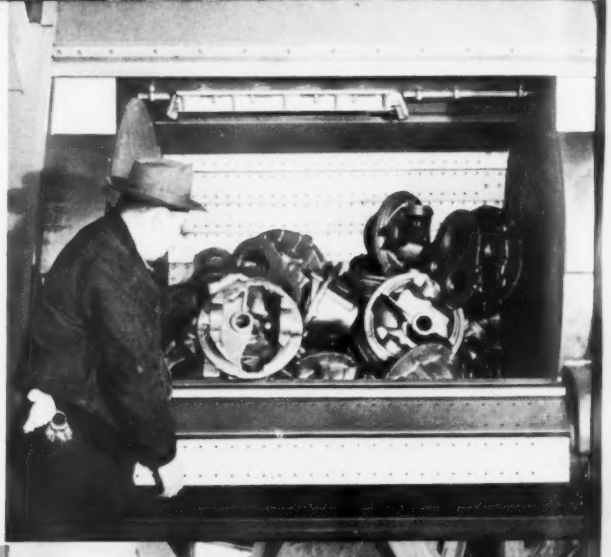
Saves
— In Maintenance
— In Abrasive Costs
— In Operating Costs
— In Cleaning Quality

Cleans the toughest jobs as fast or faster than ever before . . . and does so more economically. In 6 weeks of regular operation not a single part was worn out. "It's the best cleaning machine of its size we have in operation in our plants," is the way the manager of foundries summarizes the overall savings effected by the Super Tumblast.

At
DAYTON MALLEABLE IRON CO.
(Ironton Division)

Overcomes Maintenance Headaches

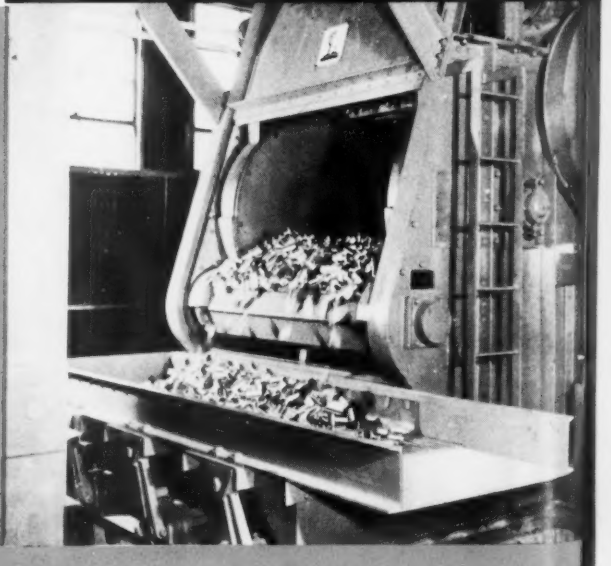
Quality cleaning, low maintenance costs and reduced abrasive consumption are made possible by the efficient separator on the Super Tumblast. The maintenance foreman, summarizing the features of the machine, says, "This machine is designed for the maintenance man."



At
INDIANA FORGE & MACHINE CO.
East Chicago, Indiana

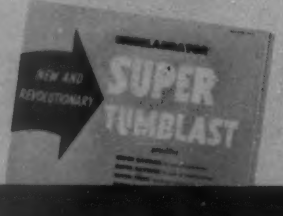
Automatic batch type cleaning becomes a reality

Doing the work of two smaller machines, the Super Tumblast cleans twice the work in half the time formerly required. The entire operation is controlled by an automatic timer which is put into action by the trucker by simply pushing a starting button after charging the loader. Substantial savings result in both labor and operating costs.



All Super Tumblasts operating with Wheelabrator Steel Shot for additional cost savings

New 12-page Brochure gives SUPER TUMBLAST details — write for copy today.



WHEELABRATOR
CORPORATION

505 S. Byrkit Street, Mishawaka, Indiana
World's Largest Manufacturer of Airless Blast Cleaning Equipment

Revolutionary new core sand formulas

CUT CORE TIME...
BOOST OUTPUT OF CASTINGS!

Sensational new binder, DEXOCOR, teams up with MOGUL, KORDEK, GLOBE dextrines to achieve results never before possible

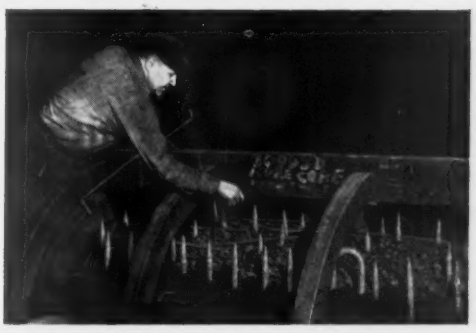
Ever wish you could avoid compromising on one important core characteristic to achieve optimum performance in another? For example—wouldn't you profit by developing high green strength and good collapsibility... good moisture resistance plus substantially reduced baking time?

These and many other hard-to-get core characteristics are now readily attainable. Used in your formula with MOGUL, KORDEK, or GLOBE dextrine, the amazing new binder, DEXOCOR, really produces—is revolutionizing core and facing sand formulation.

Ask the Man from Corn Products. Our technical department offers the friendly cooperation of experienced men on our foundry staff. They'll gladly help you formulate a *winning combination* of binders to meet your specific needs. Ask your local sales office or write.

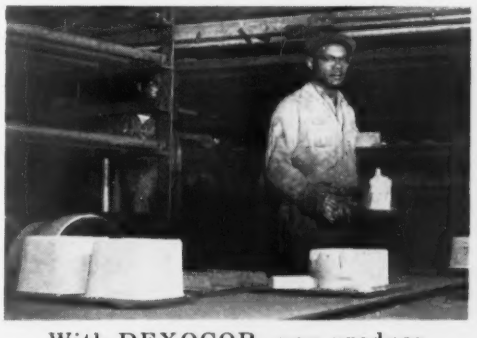
WINNING COMBINATIONS

FOR OUTSTANDING PERFORMANCE ON:	USE THIS COMBINATION OF BINDERS:
Green bond	Mogul plus DEXOCOR
Dry bond	DEXOCOR plus Kordek
Green sand	Mogul plus Dextrine or DEXOCOR
Dry sand	Kordek plus DEXOCOR
Flowability	Dextrine or Kordek
Moisture resistance	DEXOCOR
Collapsibility	DEXOCOR plus Dextrine • Kordek or Mogul
Scratch hardness	DEXOCOR plus Dextrine or Kordek
Reduced baking time	DEXOCOR
Reduced gas	DEXOCOR
Better blowing	DEXOCOR plus Mogul
Easy ramming	DEXOCOR plus Mogul
Simplified, cleaner mixing	DEXOCOR
Easy shake-out	DEXOCOR • Mogul • Kordek or Dextrine
Reduced veining	DEXOCOR
Smoother casting finish	DEXOCOR
Dry, easily handled	DEXOCOR • Mogul • Kordek or Dextrine
Less waste in handling	DEXOCOR • Mogul • Kordek or Dextrine
Better core paste	Kordek
Reduced costs	DEXOCOR plus Mogul



As a binder in facing sand for large cores and sand molds DEXOCOR has no equal.

DEXOCOR adds to cereal binder properties, blows freely, rams easily, provides increased green strength.



With DEXOCOR, you produce superior cores, faster, more easily ... and at substantially lower cost.

Higher dry strength with greatly reduced oven time is a major advantage afforded by DEXOCOR.

1906 • 50th ANNIVERSARY • 1956

CORN PRODUCTS REFINING CO.

17 Battery Place, New York 4, N. Y.

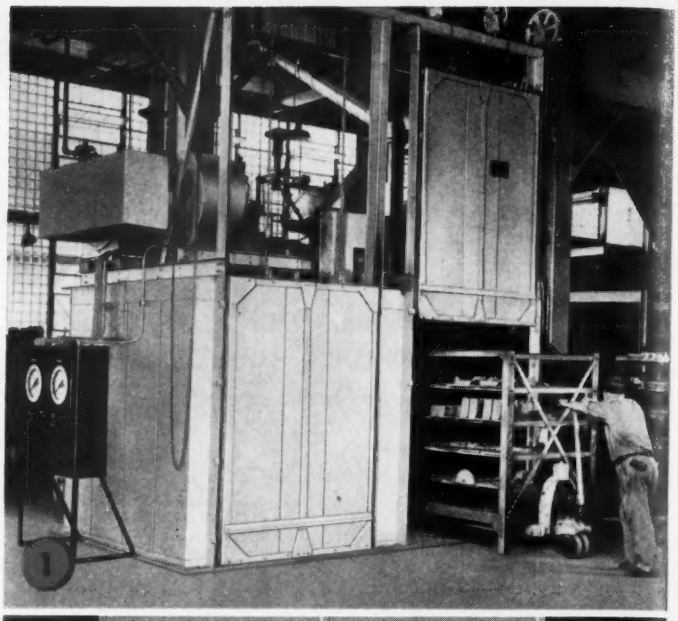
Makers of DEXOCOR® • MOGUL® • KORDEK® • GLOBE® dextrines

For more information, use Reader Service Card, page 229

carl mayer CAN DO IT

That's right, for any baking requirement there's a Carl Mayer oven that will do the job faster and cheaper, to give you the efficiency so necessary in today's competitive markets.

The exclusive heat recirculation and slotted panel construction features cut fuel costs and heating times by as much as 50%. Uniform temperatures, assured by heat recirculation, guarantee perfect baking conditions throughout the entire oven.

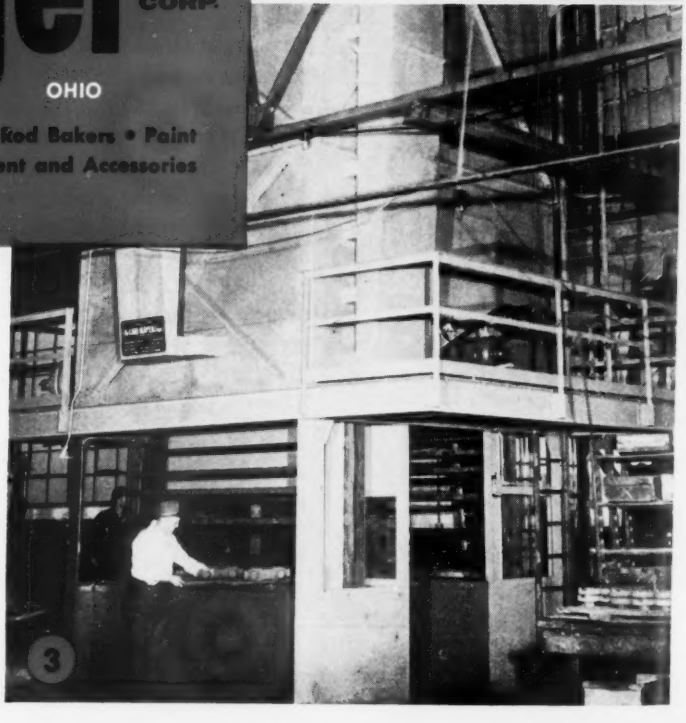


THE **carl mayer** CORP.

3030 EUCLID AVENUE CLEVELAND 15, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories

Write for Bulletin 53-CM



Hundreds of modern foundries of all sizes have found the efficiency and economy of Carl Mayer ovens pay off. Find out for yourself. Our engineers will be happy to consult with you on your particular problem.

1. This rack type oven, with heat recirculation, holds temperatures within ±5° throughout the oven.
2. Downdraft heating method on this car type oven increases efficiency up to 50%.
3. This vertical oven features the special internal heat fan—increases efficiency, lowers maintenance cost.

JUNIOR'S CONTROL KEEPS HIM "IN THE SWIM"!

(or how to win in sports and business!)

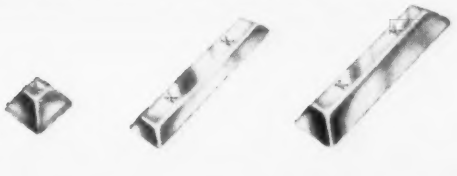
CHIEF KEOKUK:
"Where little chief? This water polo game got me confused."
CHIEF KEOKUK JR.
"Modern methods help me control ball and beat big chief."
PRINCESS WENATCHEE:
"Looks like another goal for Junior!"

In water polo or in processing iron and steel it pays to employ control! Many foundries and steel plants control costs and quality with Keokuk Silvery Pig Iron . . . the superior form of silicon introduction. Pig for pig, car for car, its uniformity never varies. Handle it by magnet . . . charge it by weight (or count the piglets for equal accuracy). Leading aluminum producers specify Keokuk Silicon Metal for uniform high purity. When you think of silicon, think of Keokuk!

KEOKUK ELECTRO-METALS COMPANY KEOKUK, IOWA
Wenatchee Division, Wenatchee, Washington

SALES AGENT: MILLER AND COMPANY
332 S. Michigan Avenue, Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
8230 Forsyth Blvd., St. Louis 24, Missouri

Keokuk Silvery Pig Iron is available in 60 and 30 pound pigs and 12½ pound piglets ... in regular analysis or alloyed with other elements to match your requirements.



Maneuverable BAKER "FT" Electric Trucks have lower silhouette, greater stability!

• Ability to maneuver safely and quickly in narrow aisles and tight places with large, heavy loads means more and faster work from new Baker "FT" electric trucks. Contributing factors are less overhang, lighter weight, lower silhouette, greater stability, shorter turning radius and greater forward tilt.

These new trucks have many other features for safe, more efficient operation. More convenient controls – right where operator wants them – are easy and simple to actuate. Absence of cowl and other obstructions means better visibility, greater ease in mounting and dismounting from either side. Dynamic braking means greater safety on ramps, smoother stops, more protection for truck and load. Self-energizing, self-equalizing hydraulic foot brakes and separate parking brake linked to driver's seat give added safety.

Capacities to 6000 pounds. Write for specific bulletins.

Baker
handling equipment

THE BAKER-RAULANG COMPANY
1223 WEST 80th STREET • CLEVELAND 2, OHIO

A subsidiary of Otis Elevator Company

6E-4

For producing the New

CHROMIUM · NICKEL · MANGANESE STAINLESS STEELS

ELECTROMET offers a variety of alloys designed to suit your specific needs

for CHROMIUM

SIMPLEX low-carbon ferrochrome—chromium 63 to 66%, carbon max. 0.010% or 0.025%.

Low-carbon ferrochrome—chromium 67 to 71%, ten carbon grades from 0.02 to 2% max.

Medium-carbon ferrochrome—chromium 66 to 70%, carbon 2.25 to 3%.

High-carbon ferrochrome—chromium 65 to 70%, five carbon grades from 4.5 to 7%.

Low-chromium, high-carbon ferrochrome—chromium 57 to 64%, carbon 3.5 to 5%.

"EM" ferrochrome-silicon—chromium 39 to 41%, silicon 42 to 45%, carbon max. 0.05%.

for NITROGEN ADDITIONS

SIMPLEX nitrogen-bearing, low-carbon ferrochrome—in 2% and 5% nitrogen grades, containing 62 to 65% chromium and 60 to 63% chromium respectively.

Nitrogen-bearing, low-carbon ferrochrome—chromium 65 to 70%, in 0.75%, 1.25%, and 2% nitrogen grades.

for MANGANESE

Nitrogen-bearing, electrolytic manganese metal—containing approximately 93% manganese (metallic basis) and 6% nitrogen.

Electrolytic manganese metal—with minimum manganese content, on a metallic basis, of 99.9%.

Low-carbon ferromanganese—manganese 85% to 90%, six carbon grades from 0.07 to 0.50% max.

MANSILOY alloy—manganese 60 to 63%, silicon 28 to 31%, max. 0.07% carbon.

for additional information

Please contact the nearest ELECTROMET office. Ask for ELECTROMET's new 4-page brochure on electrolytic manganese and the booklets on melting low-carbon stainless steel.

"Electromet," "EM," "Mansiloy," and "Simplex" are registered trade-marks of Union Carbide and Carbon Corporation.

HALF A CENTURY OF DEVELOPMENT IN FERRO-ALLOYS AND METALS
50th Anniversary
Electromet
1906 ··· 1956

ELECTRO METALLURGICAL COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
OFFICES: Birmingham · Chicago · Cleveland · Detroit
Houston · Los Angeles · New York · Pittsburgh · San Francisco
In Canada: Electro Metallurgical Company,
Division of Union Carbide Canada Limited, Welland, Ontario

NICHOLLS "AIROMATIC"

Automatically, completed mold is turned over and transferred to conveyor. Just one of the better-than-human automatic operations.

You Get Consistent High Quality with Nicholls Fully-Automatic Push-Button Molding Machines

Get a continuous flow of molds—better molds. Eliminate money-squandering risk and error. Our new No. 24 Type C heavy-duty molding machine culminates almost 50 years of experience to give you better molds at a lower cost—automatically. And automatically, profits increase as costs of production and materials decline—thanks to Nicholls. Write us for details about Nicholls heavy duty molding machines.

Cost sheets too, are in better shape, when you mold on Nicholls machines.

Now Study These Cost-Cutting Advantages

- Pneumatic Pattern Draw.
- Air-Operated Car-Type Squeeze Head.
- Built-in Flask, Roll-in, Roll-out Device.
- Sand Hopper That Measures.
- Flask Feed-in Elevator.
- Flask Indexing Device.
- Sand Spill Upset.
- Mold Turnover and Transfer.

WM. H. NICHOLLS CO., INC., Richmond Hill 18, Long Island, N. Y.

NICHOLLS

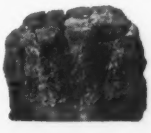
Quantity and Quality are *Guaranteed* when you specify Neville Foundry Coke

As a merchant producer of Neville Foundry Coke, Pittsburgh Coke & Chemical now has four batteries of ovens to serve you. That's your guarantee of reliable, continuing supplies when you specify Neville.

What's more, we guarantee the *quality* of our coke, too. For Neville Foundry Coke is made from clean, washed coals containing a high percentage of Pocahontas and carefully processed to produce stronger, denser, more uniform coke with more fixed carbon and less ash and sulphur. As a result, Neville Foundry Coke provides maximum temperature at the nose of the tuyere to give you hotter, cleaner, more fluid iron.

Let us fill *your* requirements today—with *guaranteed* Neville Foundry Coke, sized to your specifications.

NEVILLE **PIG IRON**



NEVILLE **COKE**

Quality Products for the Foundry Trade

COKE & IRON DIVISION

PITTSBURGH COKE & CHEMICAL CO.

Grant Building · Pittsburgh 19, Pa.

WSW 6134

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

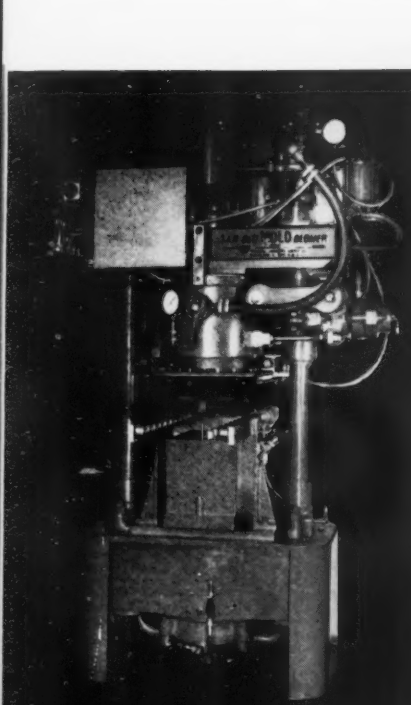
. . for mold blowing

it's SAN-BLO®

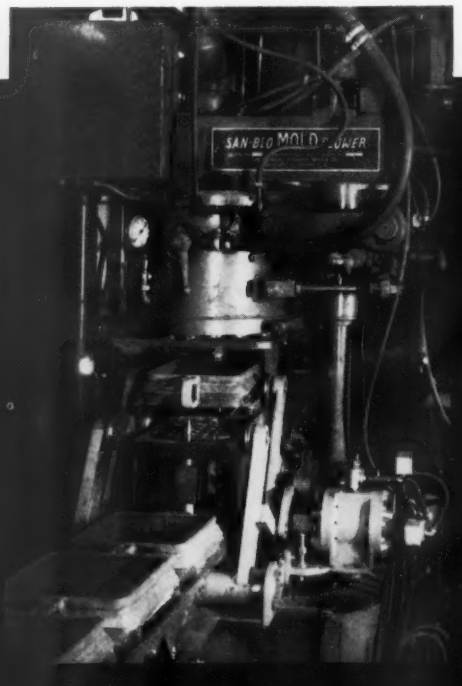
SAN-BLO meets today's foundry-industry-needs for *automation,* as well as *improved quality* of sand molds at *lower* foundry costs . . .

- Uniformly hard molds produced from conventional foundry sands.
- Accurate reproduction of patterns.
- Eliminates separate flask filling operation and need for spill sand conveyor.
- Available with a variety of flask and mold handling equipment, to automatically load and unload the machine.
- Can be used for conventional cope and drag or stack molding.
- Furnished with either manually-initiated or repetitive-automatic controls.

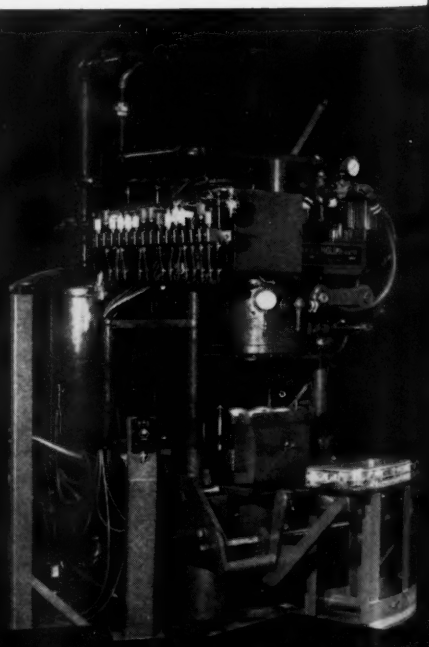
If you are interested in *"tomorrow's automation — today",* be sure to investigate SAN-BLO Mold Blowing, right now!



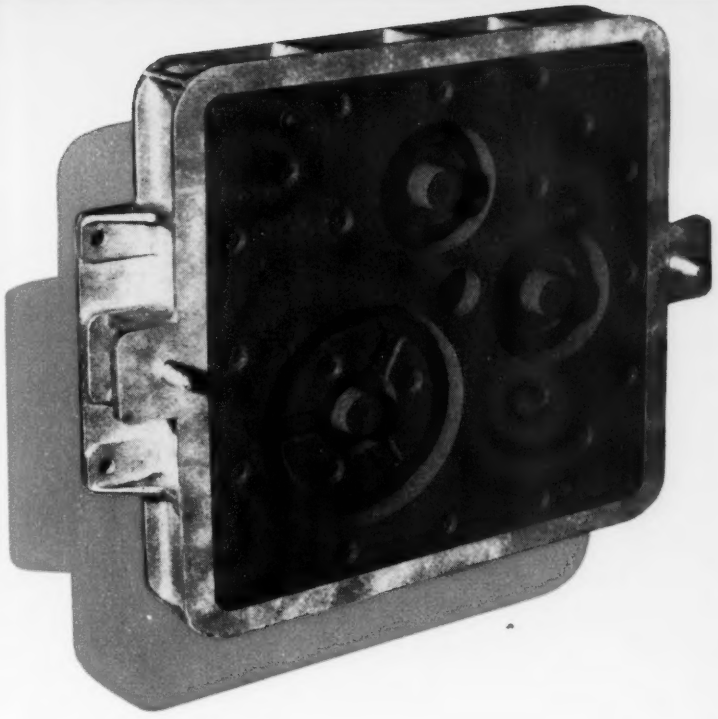
For applications where flasks are rolled through the machine on conveyors.

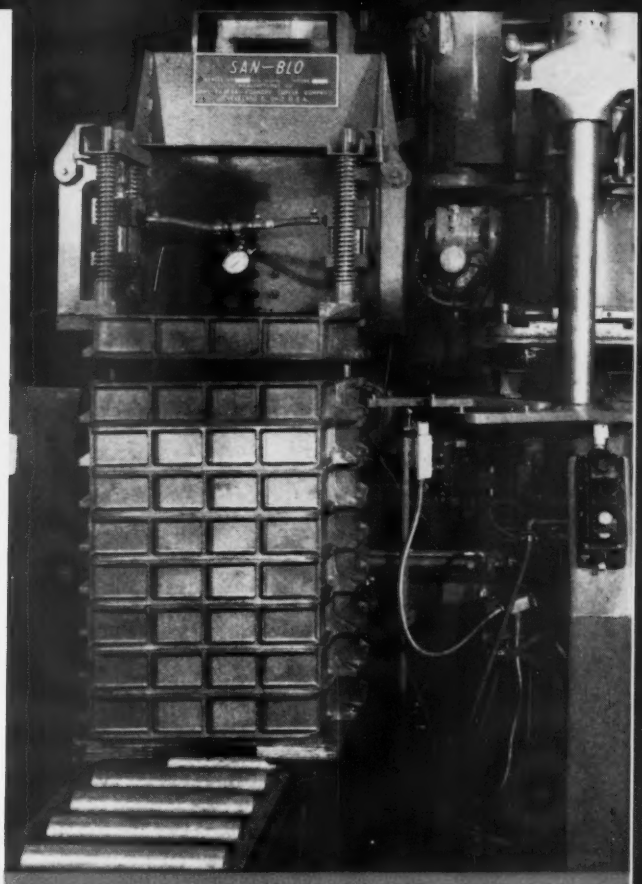


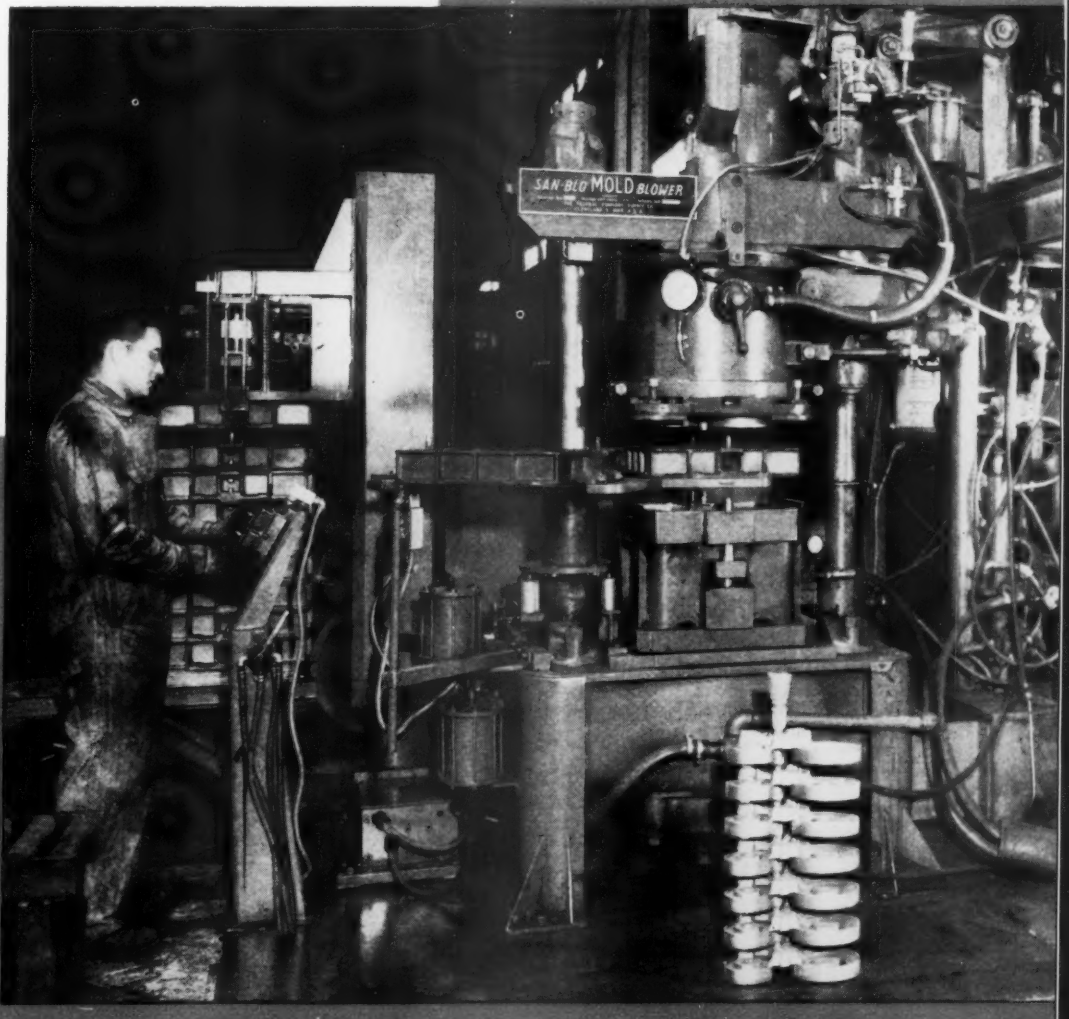
Here a mechanical handling unit moves flasks into and through the machine.



For installations where machine must be loaded and unloaded from same side.







FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

SAN-BLO mold blower for stack molding. 3-station turn table handles flasks in and out of machine and the automatic stacking unit picks off the blown molds from the turn table and automatically closes them.

San-Blo Division

The **FEDERAL FOUNDRY SUPPLY** Company

4600 EAST 71st STREET · CLEVELAND 5, OHIO

These are exciting days at Belmont
— and at our Taylor, Kentucky Works

Expansion plans two years aforming are rapidly nearing completion. . . . By early summer these new facilities will be "off and running", to help us make more and ever better Taylor-Made sillimanite, mullite, corundum and zircon super-refractories for your furnaces:

- Additional continuous tunnel kiln, designed to fire large and small special shapes.
- High capacity crushing and grinding media for controlled, uniform sizing of feed materials.
- Additional controlled batching and mixing equipment.
- A 35% increase in brick pressing capacity—denser brick, too.
- Completely new grinding and finishing facilities at the Cincinnati works.
- Deliveries will be faster, too.

Our thanks to you for your patience and understanding during our months of construction.

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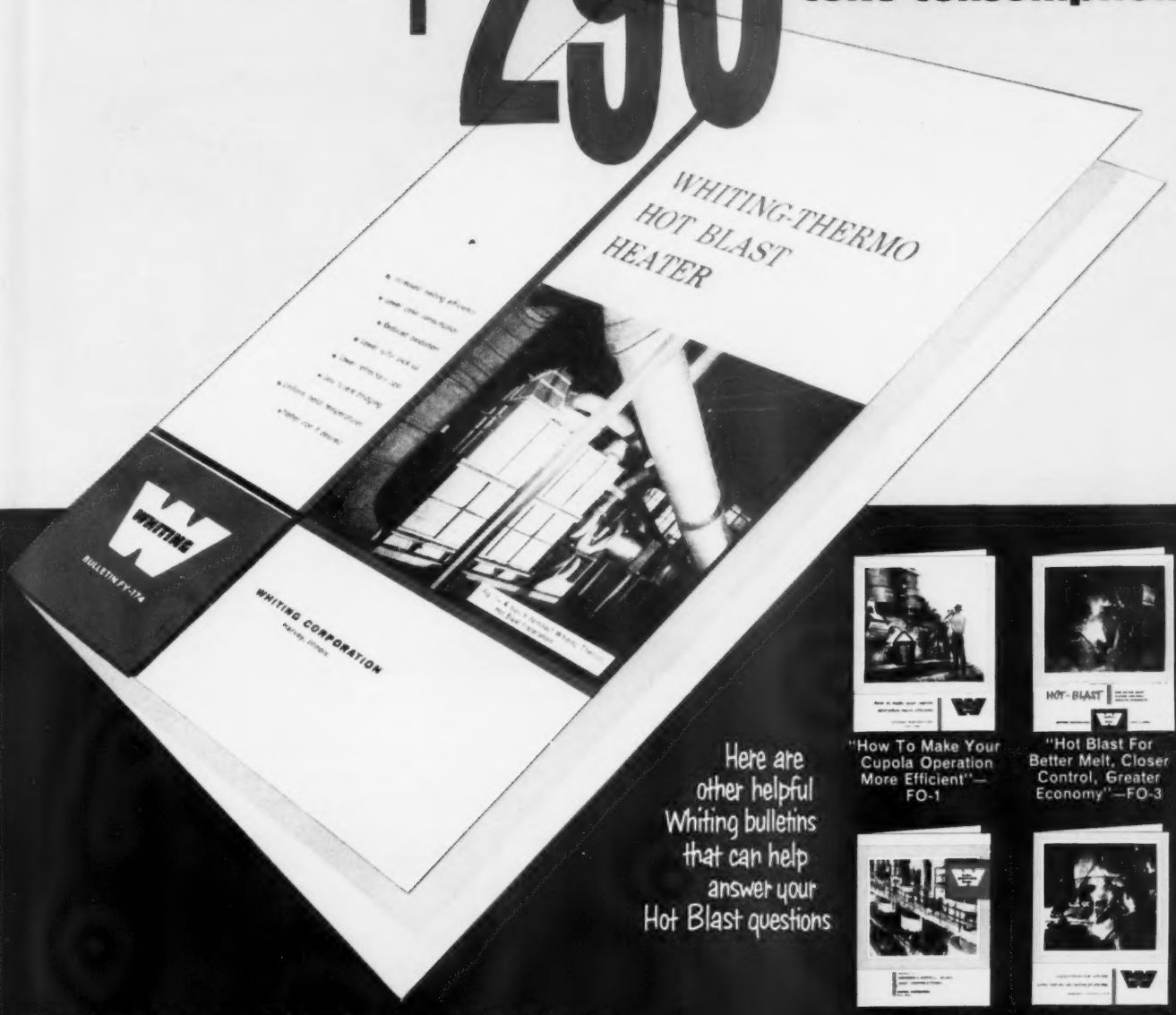
For more information, use Reader Service Card, page 229

read how you can save up to $290 a day in cupola coke consumption



Here are other helpful Whiting bulletins that can help answer your Hot Blast questions

"How To Make Your Cupola Operation More Efficient"—FO-1

"Hot Blast For Better Melt, Closer Control, Greater Economy"—FO-3

"Review Of Foundry-Cupola Gas and Temperatures"—FO-9

"Suggestions For Solving Some Cupola Operation Problems"—Bulletin FO-8

Based on an average 400-ton per day cupola melt, pre-heated blast can raise metal temperatures and at the same time create a 28% coke savings! This is possible at an expenditure of only $45 in gas fuel, giving an actual fuel savings of $290 per average work day and many thousands of dollars per production year.

Now any cupola can be converted at low cost with a Whiting-Thermo Hot Blast Heater to provide the highest efficiency in hot blast. Whiting has prepared a new booklet on this cost cutting hot blast heater which tells about all hot blast advantages. It also fully describes burners, combustion chambers, heat exchangers, air booster fans, control panel and controls, auxiliaries, and air by-pass as well as general design features. Write for this free booklet today! Ask for Bulletin FY-174. Ask for the other bulletins shown also!

WHITING

WHITING CORPORATION

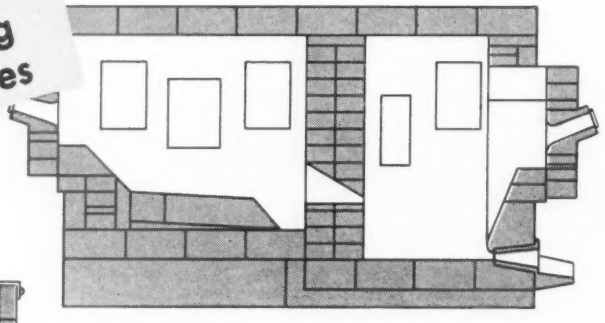
15607 Lathrop Avenue • Harvey, Illinois

With the world's most complete refractories service

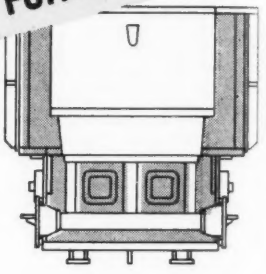
HARBISON-WALKER

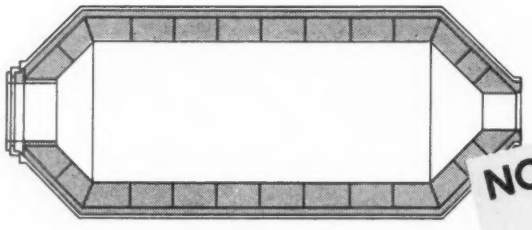
offers the widest range for your selection

ALUMINUM Melting Furnaces



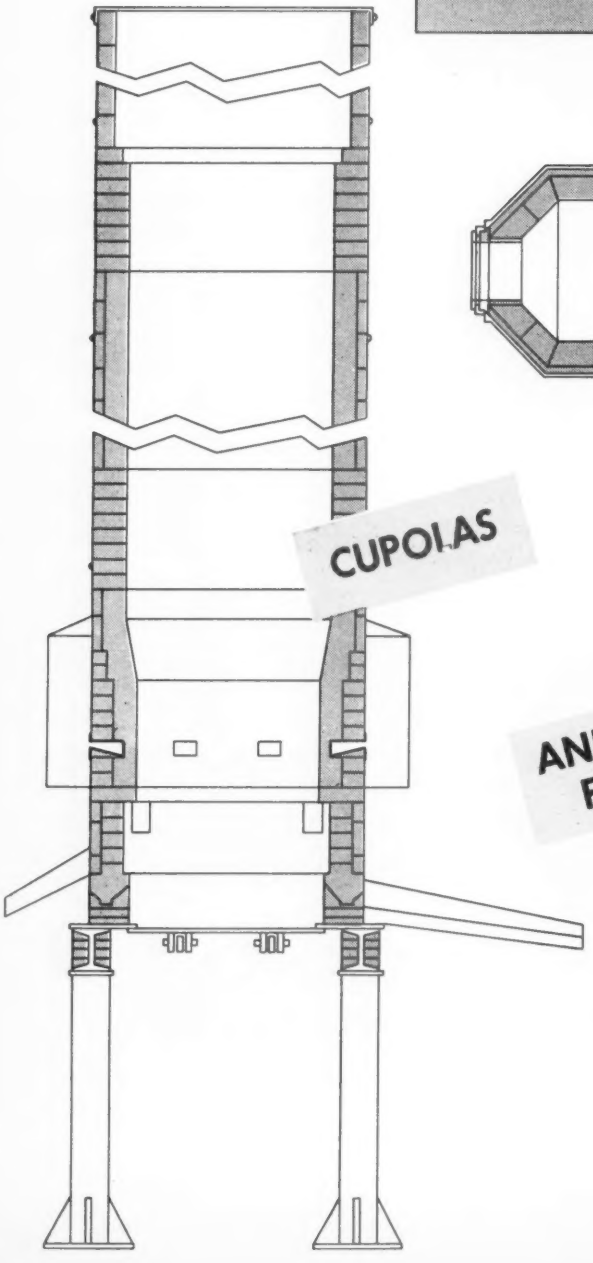
INDUCTION Furnaces



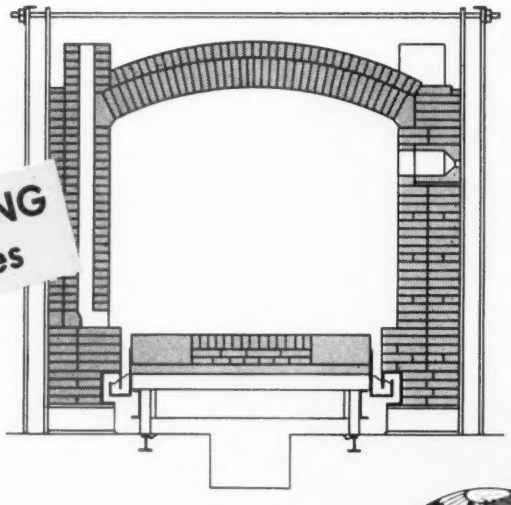


NON-FERROUS ROTARY Furnaces

CUPOLAS

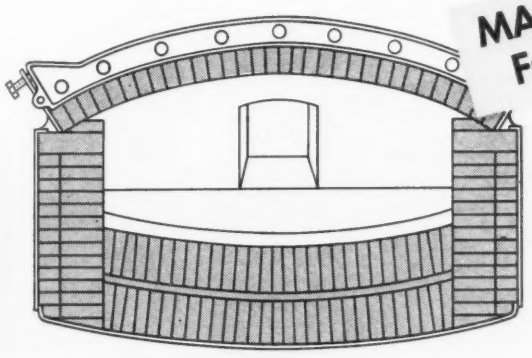


ANNEALING Furnaces

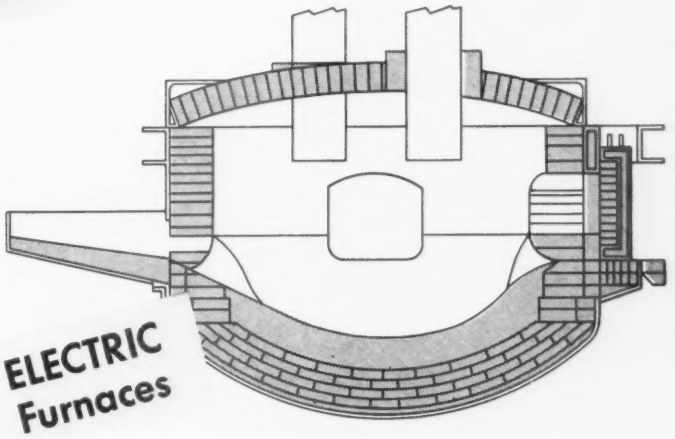


THE best balanced choice for every specific requirement can be made from the complete range of types and classes of foundry refractories, produced by Harbison-Walker.

Technical service is freely offered to assist in the selection and use of the refractories that will assure longest service-life and greatest over-all economy in any application.



MALLEABLE Furnaces



ELECTRIC Furnaces

CUPOLAS Harbison-Walker cupola refractories comprise various brands of brick and monolithic materials especially adapted for this service. Included among these are all classes of alumina-silica and basic brick, H-W KUPLOMIX for monolithic linings and H-W EXTRA STRENGTH CASTABLE for maximum wear resistance in the charging zones. H-W BLACK PATCH plastic refractory is used extensively for the bottom zone and for ladle linings.

ELECTRIC STEEL MELTING FURNACES Some of the Harbison-Walker products widely preferred for electric furnaces are STAR and VEGA (super-duty) silica brick, ALAMO (super-duty fire clay), H-W MULLITE and ANCHOR (60% alumina) brands, H-W MAGNESITE, MAGNEX and METALKASE brick and H-W C-MIX and MAGNAMIX for monolithic bottoms.

ANNEALING and HEATING FURNACES All the different classes of fireclay brick and cements, castables and all the various classes of insulating fire brick are furnished by Harbison-Walker for every requirement.

MALLEABLE FURNACES Some H-W brands which are favored for malleable furnaces include super-duty fireclay brick (ALAMO from Mo., BOONE from Ky., DEAN from Pa. and H-W SUPER SAVAGE from Md.), ANCHOR 60% alumina and ANKORITE mortar. KORUNDAL (90% Al_2O_3), CORALITE (80% Al_2O_3) and H-W MULLITE (70% Al_2O_3) are used with good economy for certain extremely severe conditions.

NON-FERROUS METAL FURNACES These comprise many different designs and involve a great variety of operating conditions for which a wide range of different refractories are used. H-W brands are available in all the kinds needed.

MOLDING ACCESSORIES For many years Harbison-Walker has specialized in the manufacture of materials for molding purposes. Some of these products are H-W MOLDSAND BOND, CALAMO for investment molds, ceramic molding media and gate and runner brick.

HARBISON-WALKER REFRACTORIES CO.

AND SUBSIDIARIES

World's Most Complete Refractories Service

GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

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Guarantee TOP Performance and Maximum Life!

Specify THESE TOP QUALITY FEATURES...

(Standard on Miller Cylinders at no extra cost)

Specify CASE HARDENED CHROME PLATED PISTON RODS

On all Air and Hydraulic Cylinders

Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

Specify "TEFLON" WIPERS

On all Air and Hydraulic Cylinders

Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. ***Available from Miller at no extra cost.***

Specify TEFLON HYDRAULIC ROD SEALS

On all Hydraulic Cylinders

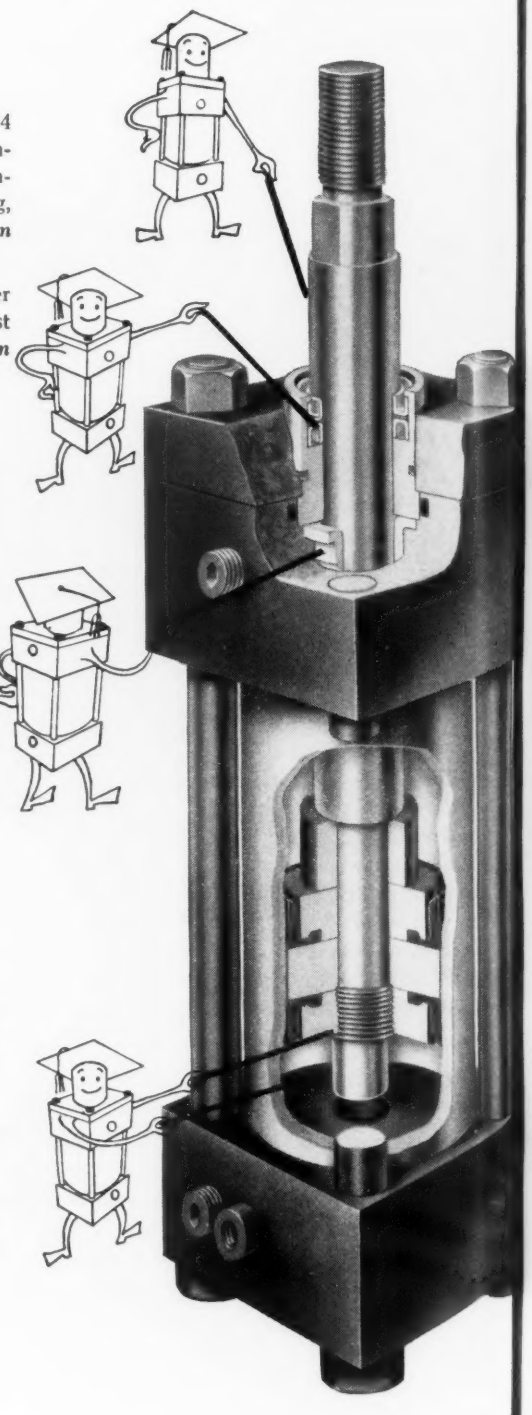
Specify RUST RESISTANT SURFACES

On all Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)



You may wish to route this entire page to the proper department in your company, by using this handy form. Additional copies on request. →

To (Dept.)_____

"On all our future cylinder requirements, please specify the above quality features."

Signed_____

Title_____

NOTE. On all Miller Hydraulic Piston S Leather Cup Seals are *standard,* Piston Seals are optional at *no extra cost,* and "Te Cup Seals are available *at extra cost.*

Member of the National Fluid Power Association

MILLER FLUID POWER DIVISI FLICK-REEDY

SALES AND SERVICE FROM COAST TO COAST

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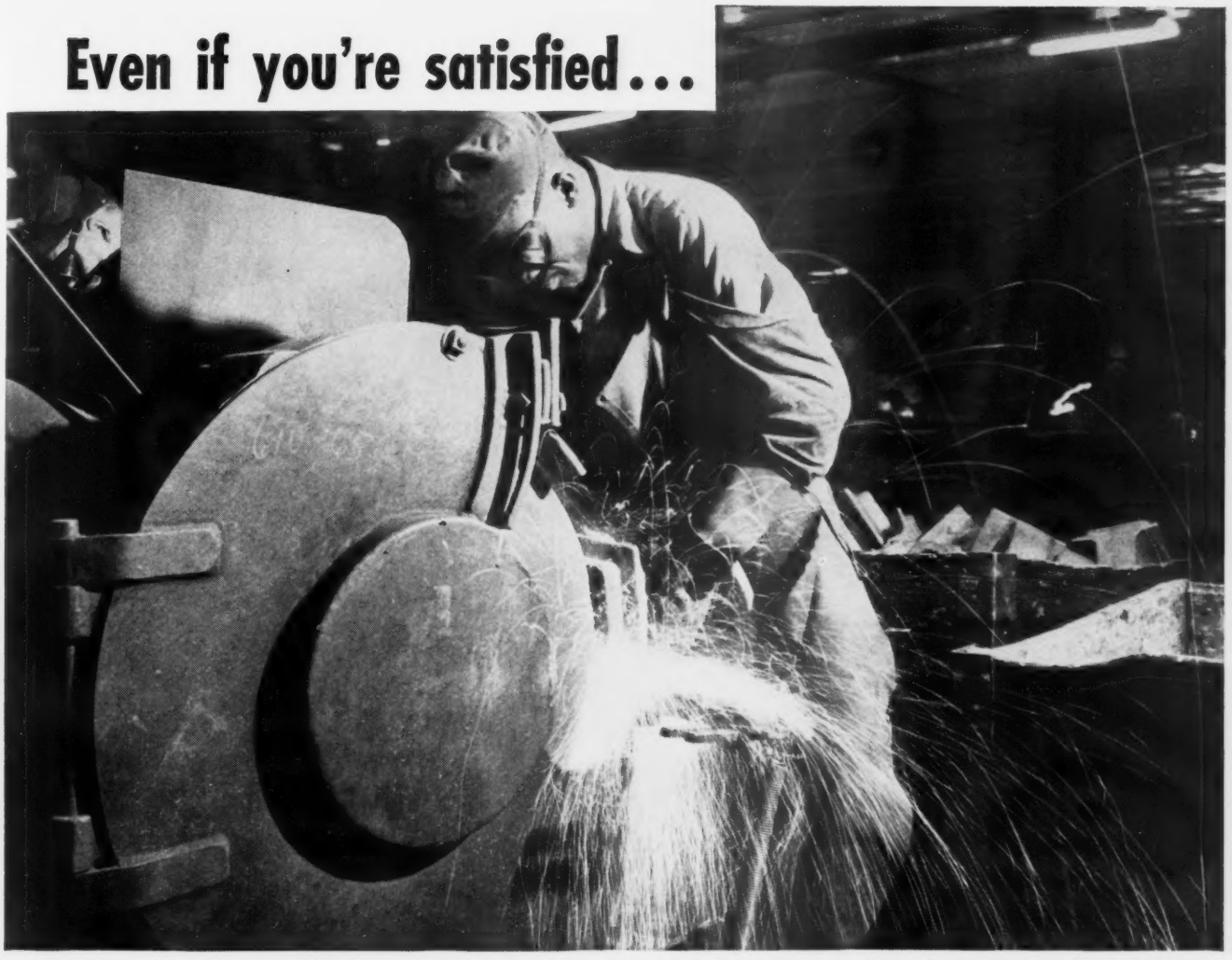
AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMU
COUNTERBALANCE CYLINDERS

Even if you're satisfied...



Here's why you should test Mid-West Snagging Wheels in your foundry NOW

If the Mid-West wheels prove to be better than those you are now using, you will be able to cut your grinding costs still more. If our products are equal to your present abrasives, then you have another good source of supply. Even if our first test doesn't meet your standards, the test is insurance that you are now using the right product for your specific job.

Are you already stocked with abrasives? Test now while you have a supply on hand—don't wait until it is time to buy.

Is your foundry swamped with work? The best time to test is while you are trying to cut costs under the conditions of high production.

Rather than merely tell you all about our fiber-cushioned snagging wheels, plugs and cones, cup wheels, cut-off wheels, depressed wheels, or coated abrasives, we want to prove the merits of our product as applied to your problems. Our abrasives are successful for you only if they work in your plant on your products under your production conditions. Let us place some wheels in your plant against competition to substantiate our claims. Just fill in the coupon or contact our main office in Owosso, Michigan.

MID-WEST ABRASIVE CO.

Executive Offices:
510 S. Washington St.,
Owosso, Michigan

MID-WEST QUALITY ABRASIVES

SEND THIS COUPON TODAY

Midwest Abrasive Co.

510 S. Washington St., Owosso, Michigan

Please have your local representative contact me to arrange for a test in my plant.

Name_____

Company_____

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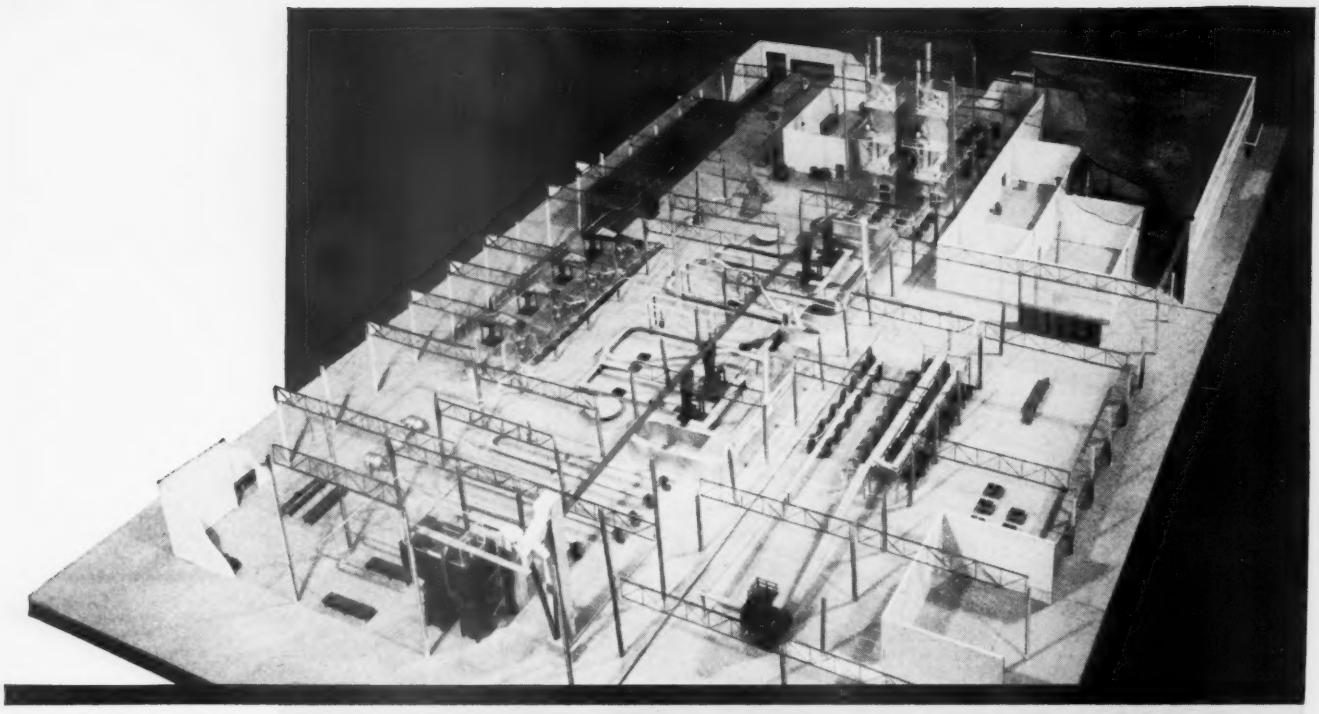
City_____ State_____



Knight services include:

Foundry Engineering
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Cost Control
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Production Control
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Modernization
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Mechanization
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Methods
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Materials Handling
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Automation
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Survey of Facilities

AUTOMATION, SEMI-AUTOMATION, MECHANIZATION are a "must"

for profitable operation today of the Production and Production Jobbing Foundry

This model is a proposed modernization of an existing brass foundry. Operations are automated, semi-automated, and mechanized to a high degree to insure maximum productivity per man hour, with total production up to 12,000 tons of castings per year with a balanced 2-shift operation.

A reduction of approximately 55% is anticipated in man hours per ton of good castings, from new materials to finished castings ready for the machine shop. Working conditions are to be improved and more efficient controls of melting, sand, pouring, cores, and other variables should permit high quality castings with a minimum of scrap.

This program resulted from a survey of Knight Engineers with client personnel to determine, for this problem, the most modern technological improvements and new materials, methods, and controls that could be economically justified. Knight Engineers have made hundreds of surveys in all types, classes, and sizes of foundries to assist their clients to reduce costs, improve quality, working conditions, and financial return to workers, management, and owners.

Write for Knight Bulletin No 101, "Professional Foundry Engineering."

EVIDENCE OF EXPERIENCE

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TEST THEM and you'll know why so many cleaning rooms say
"These new Hot Press Resinoid Snagging Wheels last longer,
grind faster and stand up better than any other wheels
we've ever used." Ask your distributor or the man from

CARBORUNDUM

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Write for FREE Bulletin— "Helpful Hints for Making Quality Castings"

BRASS • BRONZE • ALUMINUM
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For 50 years WESTERN METAL COMPANY has produced quality metals for the foundry industry. Uniformity has been the byword and the builder of the present reputation held by this company. Our aim is to continue to improve our standards— not merely to be satisfied with the present quality and uniformity.

To help you with today's high standard requirements in quality castings, WEMCO provides complete laboratory service and experienced field metallurgists.

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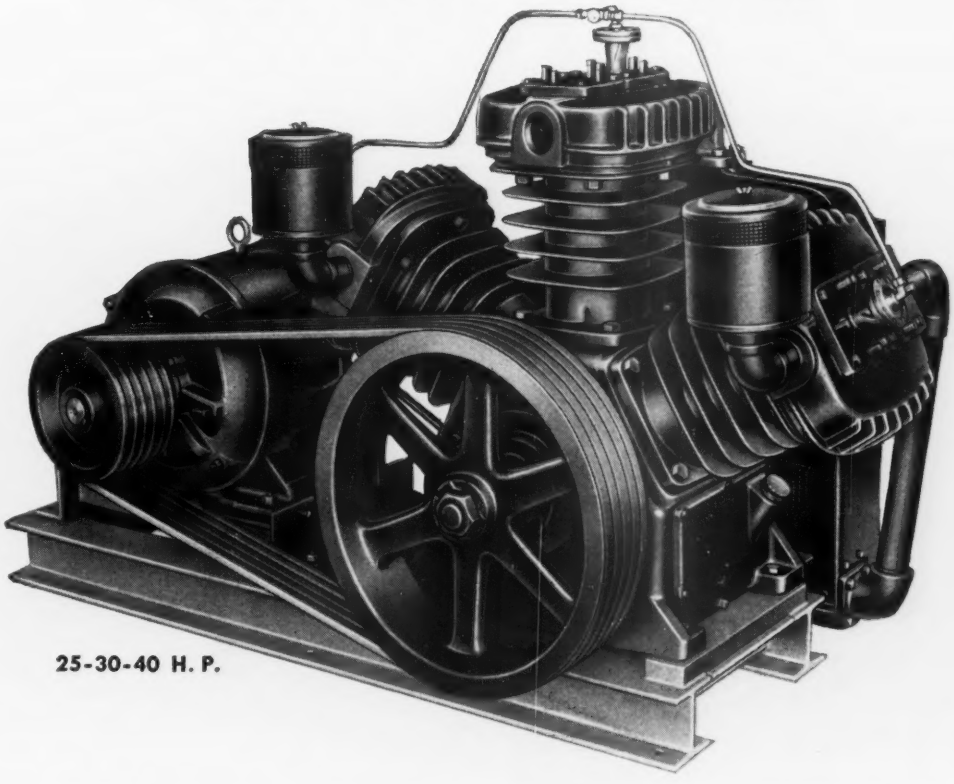
Smelters and Refiners of Brass and Aluminum Alloys

THE NEW CURTIS MODEL C-100
TWO-STAGE, AIR-COOLED AIR COMPRESSOR

Provides Higher Operating Efficiency
Costs Less to Install



25-30-40 H. P.

THIS NEW Curtis Two-Stage will deliver more air per minute, per horsepower and per kilowatt hour of electrical energy consumed, thus assuring a saving in your electrical bill.

It's Air Cooled, thereby eliminating expensive water bills and assuring quick and easy installation with no complicated plumbing problems.

The new C-100 embodies all the well-known Curtis engineering features such as centro-ring oiling and Timken Main Bearings.

For complete information write for illustrated folder.

Remember, you can count on... OUR 102nd YEAR

Curtis

MANUFACTURING COMPANY • PNEUMATIC DIVISION

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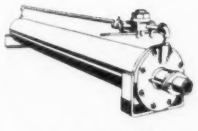
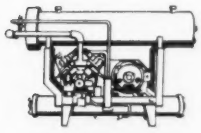
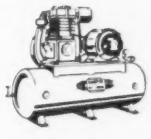


AIR HOISTS
AIR CYLINDERS



PACKAGED LIQUID
CHILLERS

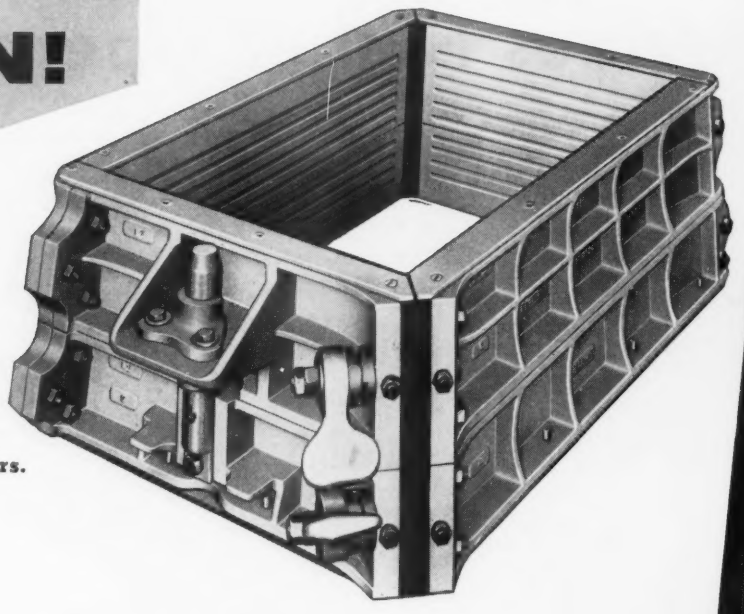


AUTOMOTIVE
AIR COMPRESSORS

AUTO LIFTS

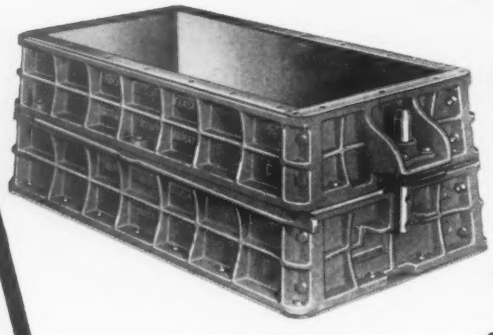
PACKAGED
AND
REMOTE
AIR
CONDITIONING

Performance PROVEN!



Fremont magnesium Spreadlock Flasks by actual use have been proved easier to handle . . . much sturdier than aluminum. They take abuse . . . last longer.

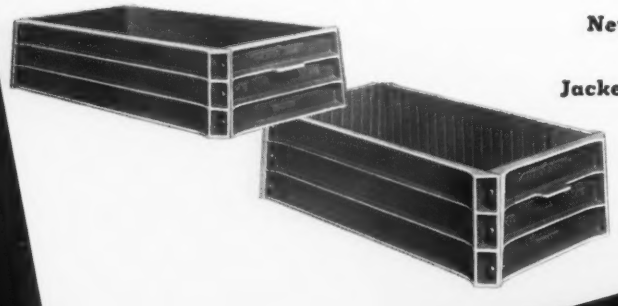
Accurately machined, they assure more exacting work. The men like them. No sand can lodge in the corners. Gaps are completely closed by long-life, replaceable live rubber inserts.



GUARANTEED PERFECT ALIGNMENT

The foolproof GROOVLOCK pin on Fremont Standard Slip Flasks is the difference.

SAVE IMPORTANT MONEY

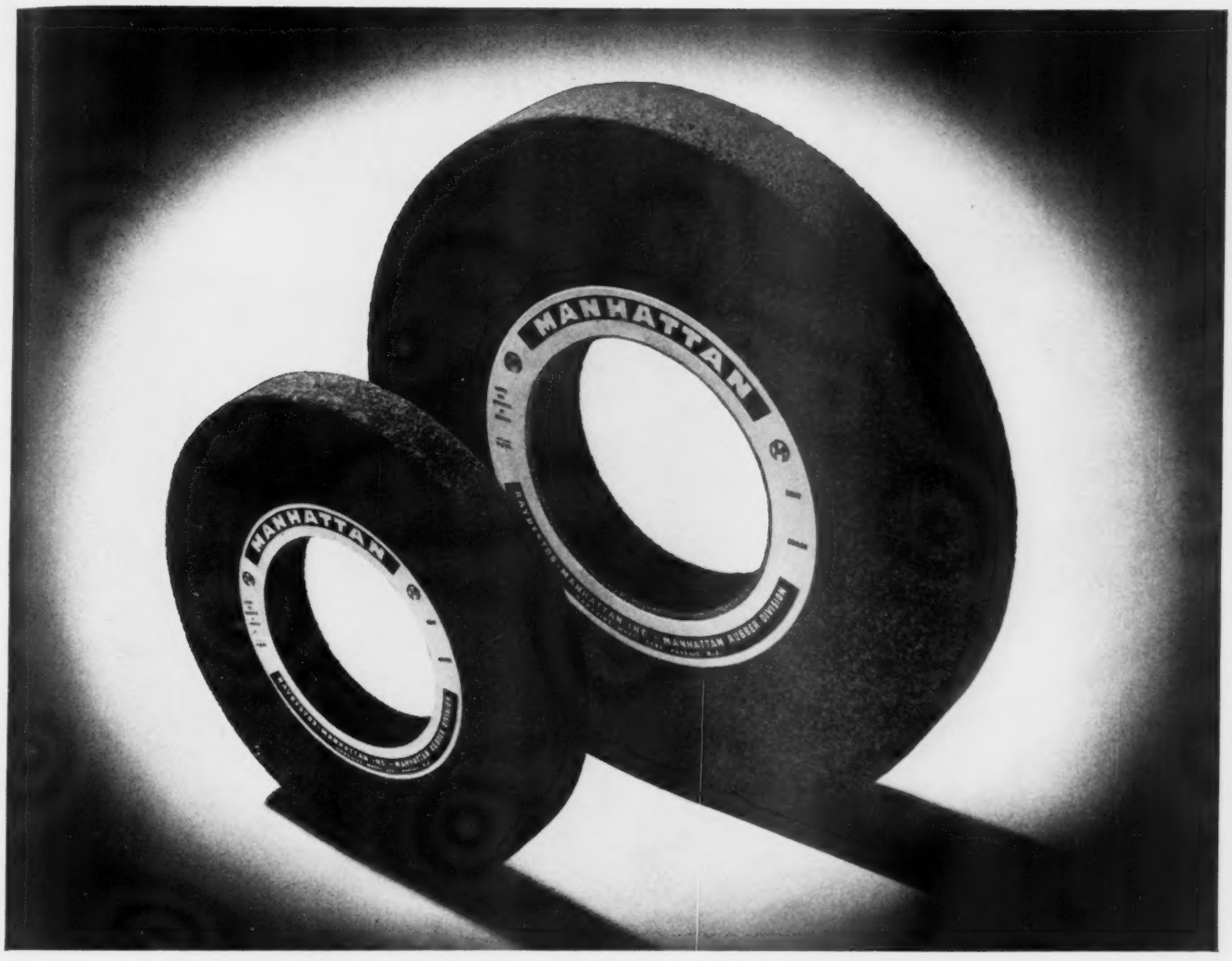


New sides or ends can be quickly inserted in Fremont Cast Iron or Cast Aluminum Jackets. Entire jackets need never be scrapped.

Write today for free literature and prices. All orders given prompt attention.

The Fremont FLASK Co.

Fremont, Ohio



MANHATTAN SNAGGING WHEELS
Remove More Metal at Less Cost

For maximum efficiency with stand or swing frame grinders, snagging wheels must be engineered for *your specific* grinding conditions. Manhattan snagging wheels are custom made to meet these conditions. A careful analysis of your particular needs by Manhattan abrasive wheel engineers determines the type of abrasive, grain size, hardness, structure and bond of the wheel you require. Tests have proved that Manhattan Snagging Wheels formulated by this method give maximum cutting action, permit free cutting at highest speeds . . . and *last longer!*

To protect you on reorders, laboratory and manufacturing quality controls at Manhattan assure duplication of the original engineered performance. You maintain this faster cutting and greater economy . . . *more* metal removed at *lower* cost with every Manhattan Wheel you buy.

Let a Manhattan representative show you how you can get longer, trouble-free service . . . "More Use per Dollar" . . . with custom-engineered Manhattan Snagging Wheels, and other types of high speed, heavy duty wheels.

RM636

GRINDING WHEEL INSTITUTE MEMBER

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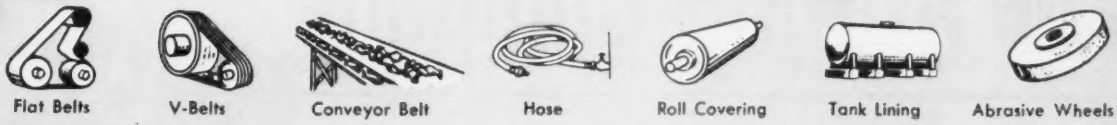
WRITE TO ABRASIVE WHEEL DEPARTMENT
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



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Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
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ADAMS ALUMINUM EASY-OFF FLASK

Built for You in Any Length, Width or Depth

Make real savings from these advantages!

RIGID CONSTRUCTION from our proven corner design, permits less weight with no loss of strength.

SOLID CORNERS are of the same design used on Adams Aluminum Slip Flasks. This interlocking tongue-and-groove construction is retained in perfect alignment with bolts secured through tapped end sections and locked with washers and nuts. Important! This construction has proved far superior to other forms of corner design.

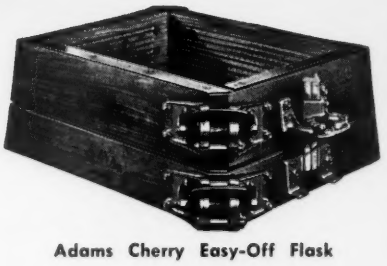
MALLEABLE TRIMMINGS are used on Adams Aluminum Easy-Off Flasks as on all other flasks we manufacture.

OPERATING MECHANISMS are identical with those used on the Adams Cherry Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

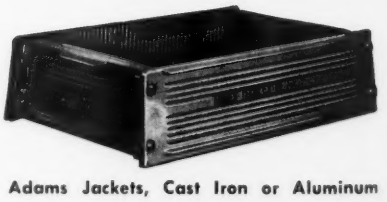
STEEL PROTECTING STRIPS are standard equipment at top of cope and bottom of drag. Aluminum strips available upon request at no extra charge.

HANDLES AND TRUNNIONS are available when specified.

PIN AND EAR ARRANGEMENT available to interchange with present pattern plate guides.



Adams Cherry Easy-Off Flask



Adams Jackets, Cast Iron or Aluminum

Adams Steel Jacket

Did you get the Adams story last month at the 60th Castings Congress and Show? It told you how Adams Flask Equipment meets your requirements in practically all methods of production. If you missed it, write today for Adams big profit-making catalog.

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

Got time to let us engineer your grinding job and save you money?

There's never been a better time to ask for a Peninsular study of your grinding problems. Our Abrasive Engineers are now backed by new, enlarged research and engineering facilities, and stand ready to serve you.

The right wheel for the job can save you plenty on portable grinding jobs. Let Peninsular take a look at yours. You may well realize substantial savings through increased efficiency, longer wheel life, or both.

Call, write, or wire us today!

Resinoid and Vitrified Grinding Wheels

PENINSULAR

GRINDING WHEELS

PENINSULAR GRINDING WHEEL DIVISION—ABRASIVE AND METAL PRODUCTS COMPANY—DETROIT, MICHIGAN

THAT one is no good!

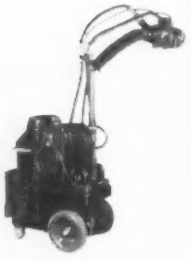
Wouldn't you like to be *that* sure about duds in your own production? Nondestructive radiography (either x-ray or gamma ray) could do it for you maybe.

***Anything* you buy or sell which needs "seeing into" is fair game for this versatile inspection method . . . weldments, castings, assemblies, plastics, wood, metal . . . right across the board from paper-thin stuff to foot-thick steel.**

If you need to spot hidden defects to keep a firm finger on quality control, we'll be glad to tell you what radiography can do for you.*

** There's probably a Picker District office near you (see local 'phone book). Or write Picker X-Ray Corporation, 25 South Broadway, White Plains, New York.*

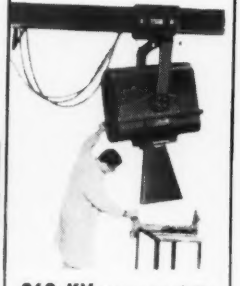
5 to 50 KV
Small as a filing cabinet, yet it will x-ray anything up to ¼" thick aluminum. Self-contained, completely rayproof.



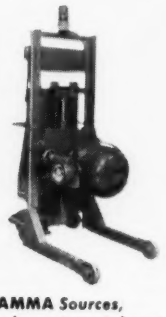
150 KV
Penetrates up to 1" steel and 5½" aluminum (more with screens). Stationary or mobile for "on-the-spot" x-raying.

250 KV *portable*
Rugged, lightweight 250 KV tubehead with separate remote power chassis. Will enter openings as small as 15" square.

RADIOGRAPHIC CABINETS
Rayproof enclosures obviate need for lead-lined rooms. Available with or without feeder tables.



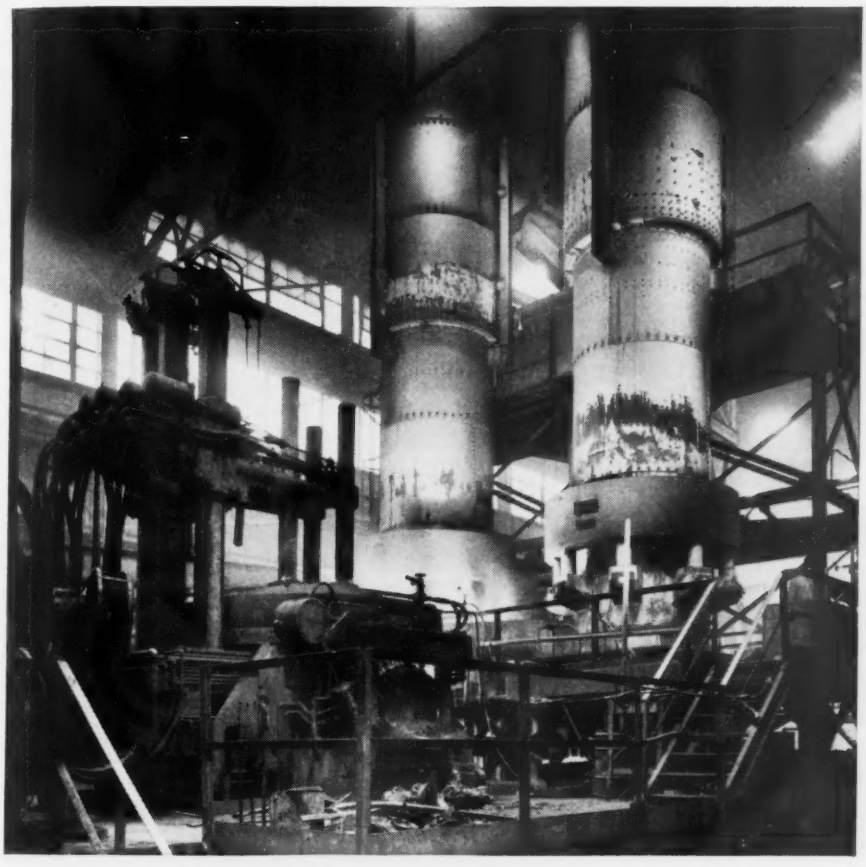
260 KV *crane or dolly*
For heavy-duty inspection (up to 3" steel). Operating down to 60 KV, will x-ray a wide range of other materials.

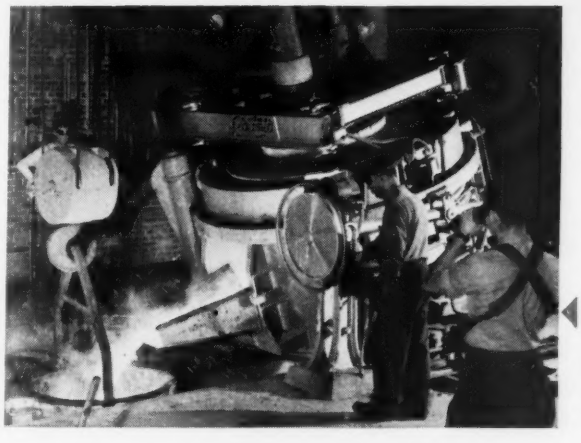


GAMMA *Sources, equipment, containers.*
Panoramic, circumferential, and directional projectors using cesium, iridium or cobalt isotopes.

one source for everything in Picker x-ray **radiography and fluoroscopy**

Lectromelt* Holding Furnace at Fairbanks-Morse foundry helps keep production and quality high





▲ Metal produced in these two 54″ cupolas is run into the Type PT Lectromelt Forehearth Furnace alongside.

◀ The electric furnace provides a ready source for metal whenever it's needed on the pouring floor.

● Gray iron castings for pumps and engines are higher in quality because of this cupola-holding furnace combination at the Fairbanks, Morse & Company foundry in Kansas City. The metal temperature is held constant in the Lectromelt furnace and metal analyses are uniform. These can be readily adjusted to suit any special requirements.

Pouring can continue at an even rate throughout the day, as the Lectromelt furnace provides an 11-ton storage capacity. No dependance on a variable melting rate.

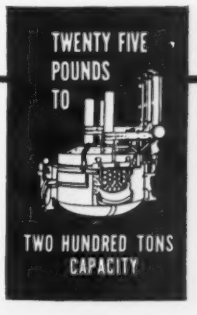
Whether you're wanting to produce metal in an electric furnace or hold and adjust cupola-melted iron, there's a Lectromelt furnace to meet your needs. For a copy of Catalog 9-A describing these furnaces, write Lectromelt Furnace Company, 314 32nd Street, Pittsburgh 30, Pennsylvania. (A McGraw Electric Company Division.)

Manufactured in . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa . . . JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF

MOORE RAPID

WHEN YOU MELT... *Lectromelt*



At the dry sand pile, the 15 cu. ft. capacity Michigan 12B consistently comes up with heaping bucket-loads like this. Bigger loads, faster cycles produce more tonnage.

Michigan 12B handles 300 tons of sand daily . . .

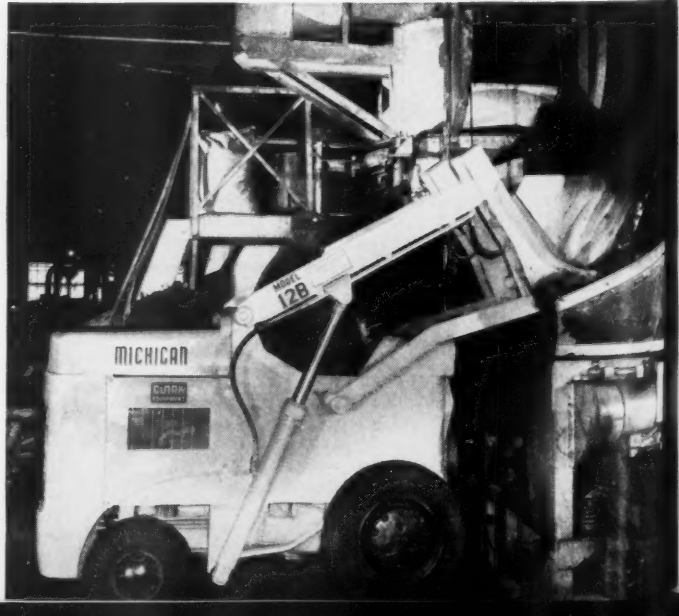
Chicago foundry formerly needed 2 loaders to keep up with muller—now does it with one

Until a few months ago, a Chicago gray iron foundry required two industrial tractor shovels to load sand into the muller and distribute it to the molding stations. One loader couldn't keep up with the muller, so the second loader was needed during peak periods. When the management decided to replace their oldest loader, they requested on-the-job demonstrations of leading makes. After they had seen them all, they bought a Michigan 12B. *It was the only machine which could keep up with the muller.*

Handles 300 tons of sand per day

The principal job of the 15 cu. ft. Michigan is sand handling. Round trips from the muller to the molding stations average about 300 ft. through narrow aisles and supporting columns. The 12B actually handles about 300 tons of sand per day: loads 105 tons into the muller, distributes 75 tons to the stations (the balance goes by over-

Fast bucket action: approaching the muller hopper, the operator steps on the brake, automatically puts the transmission in neutral, diverts full engine power to the bucket action.



(Advertisement)

head crane into a sand slinger) and brings back 105 tons of burned-out sand to the pile. The 12B just "walks" into the heavy, lumpy pile, works the bucket and comes out with a heaping load. With its power-shift transmission, the 12B gets in and out fast, saves vital seconds on every cycle.

Loads out refuse

An overhead conveyor dumps refuse into a corner of the plant. During its free time, the 12B loads out the refuse, piles it in the yard for removal by a contractor's power-shovel. This refuse is *extremely rugged stuff*—miscellaneous junk, waste sand and burned-out cores. Even here the 12B, with its 3-to-1 torque converter and powerful bucket action, brings out heaping bucket-loads.

Why they bought the Michigan

The management group agreed that the Michigan was "simply more machine for the money"—20 percent heavier and more powerful than most machines in its class. The 12B is the only Tractor Shovel in its size-range with a power-shift transmission—eliminates the clutch pedal and engine clutch. The 12B has a planetary-wheel drive axle—takes 70% of the torque load off the axle shaft, virtually eliminates broken axles. Air and oil filters prolong engine and transmission life.

How to buy a tractor shovel

During its on-the-job demonstration, the 12B clearly proved its ability to *move more tonnage* at less cost. Make your own comparison: don't buy an industrial Tractor Shovel until you've seen the Michigan 12B in action. Write now to arrange a demonstration—you name the job!

Michigan is a registered trade mark of

CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2475 Pipestone Road
Benton Harbor 26, Michigan

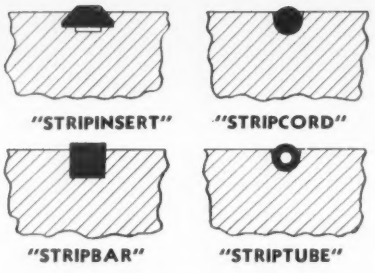
Digging heavy refuse to move it outside, the 12B demonstrates its ability to dig where other machines just spin their wheels.

Low-level bucket action at the muller gets heaping bucket-loads fast; big loads and fast power-shifted cycles enable the 12B to keep up with the muller at peak production.

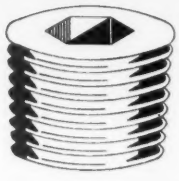
Good visibility with a full load—the operator carries the bucket low. Note how the operator's left hand rests conveniently on the power-shift lever.

Martin Products Give
Complete Core Box Protection!

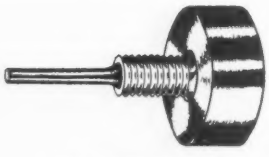
"SAND ARRESTER TUBE"
Blows perfect core without hand work; prevents bell mouth blow holes; saves cores, castings and time.



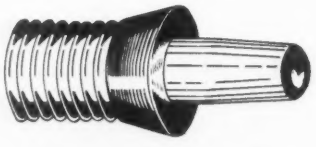
Hold Parting Line



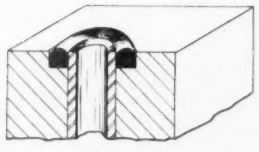
"HOLINER" BUSHINGS
Seals around blow holes at the junction of blow plate and core box.



"PULLINSERT"
Stops abrasion under blow holes. Needs no adhesive, is easily replaced.

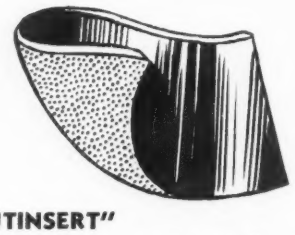


"PROTEXABOX" PIN
Can't mar box parting, never vibrate loose, prevent pin lug damage.



"D RING" COLLARS
Seal around the top of blow tubes, vent rods and guide pins.

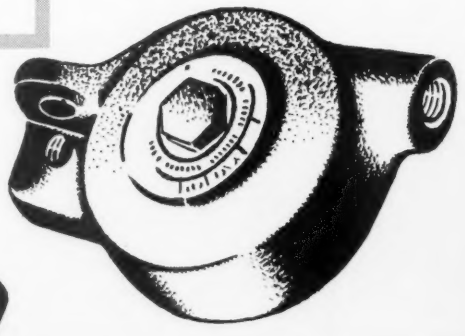
"SUPER SLICK"
Core room and foundry hand tool. Use to scrape, pry, chisel and pull nails. A new one free if you return one broken.



"CUTINSERT"
Resilient abrasion resistant sheet stock for inlays, overlays and gaskets. Oil and heat proof.

"VIBROLATOR"

Quiet non-destructive vibration for draw plate, feeders and magazines. No maintenance or lubrication necessary.



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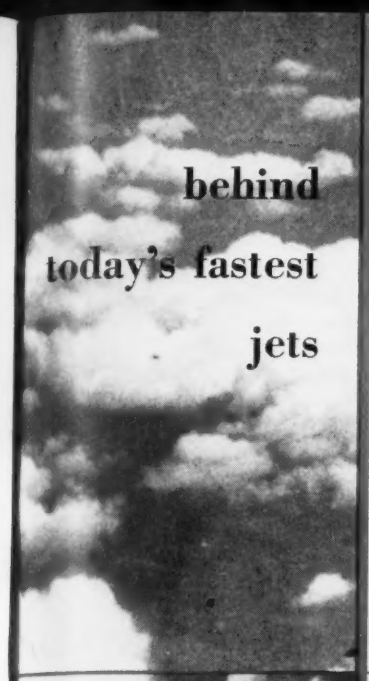
All Martin Engineering products are unconditionally guaranteed to do the job you expect of them or they may be returned for full credit. Our engineers will give full cooperation supply samples or work with you on new and different applications.

Ask your Distributor or Write for Catalog

MARTIN ENGINEERING COMPANY
704 FOUNTAIN ST., NEPONSET, ILL.



DEMMLER

The Oldest Name in Core Blowers

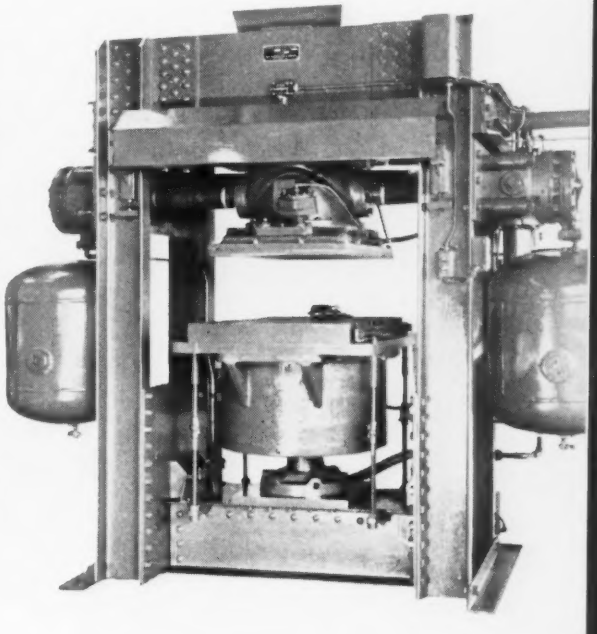
the DEMMLER 104-E

Rugged, jet-like—the DEMMLER 104-E typifies design leadership based on 47 years experience in the core blowing field.

Providing high-speed operation in combination with an accurate 10″ draw stroke, the mighty 104-E features 24″, 26″ or 30″ clamping cylinders. It is capable of handling cores from 50 to 350 pounds.

Like the three smaller sizes in the 100 series, the 104-E is a stationery magazine type core blower for blowing both core and molding sand.

Whatever size cores you handle in your plant, there's a DEMMLER to save you time and money. Call a DEMMLER engineer for a complete survey of your requirements today.



PRECISION CORE BOX VENTS

Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

NEW *HL* ***150 Mesh Vents***

A new general purpose vent which practically eliminates the cleaning courser screens demand. Write for literature on Demmler vents.

WM. DEMMLER & BROS.

KEWANEE, ILLINOIS

NOW... SAVE CO_2

In CO_2-Sand Hardening Process *with*

FLEX-RITE

"Positive Pressure Control"

VALVES

WILL NOT LEAK — saves both CO_2 and money . . . convenient . . . easy to operate!

NO PACKING, NO SPRINGS — no complicated parts to wear out!

VALVE SEATS MADE OF "TEFLON"* — seal more perfectly the longer they are used!

GUARANTEED — against defects in workmanship and materials!

*"TEFLON", DUPONT'S REGISTERED TRADE MARK FOR TETRAFLUOROETHYLENE RESIN

Write for more information on FLEX-RITE CO_2 Valves, also FLEX-RITE Air Control Valves and Spray Guns.

FLEX-RITE VALVE & MFG. CO.

P. O. BOX 1855 — TULSA, OKLAHOMA

Readers' Comment

Doing It More Simply

TO THE EDITORS:

The "How To Do It" item on page 184 of the March issue presents a project we taught freshmen at Purdue, so it is not too difficult. You will find however, that if you ram the cope first, roll it over, cut the parting, ram the floating cheek, ram the drag, draw the drag, draw one-half pattern, replace the drag, roll it, draw the cope, draw one-half pattern, cut the gate and replace the cope, you have the same mold with two rollovers. You show three complete rollovers. By employing the two-roll-over method, use of a crane for roll-over is decreased 33 per cent; or if by hand, there is less wear on the molder.

JOHN G. STEINEBACH
Foundry Engineer
A. P. Smith Mfg. Co.
East Orange, N. J.

●

TO THE EDITORS:

In the March 1956 issue of FOUNDRY on page 184 is a diagram and article on molding a split pulley wheel. The procedure given is very correct, but here at the U. S. Navy Class A Molder School we have been teaching a little different procedure.

In our procedure, step 2 would be the cope to be rammed first, step 3 would be ramming the drag, step 4 would be removing the drag and half of the pattern, step 5 consists of rolling the entire mold and removing the cope half of the pattern and finishing the mold. I believe this method is a bit more simple.

This procedure may be of some help to the author of the article in your magazine.

R. R. SMITH, MLC USN
Instructor
Class A Molder School
U. S. Naval Base
San Diego, Calif.

* * *

Pattern Is Means to End

TO THE EDITORS:

Dewar Forbes' "Patternmaking Memories" appearing in the March issue of FOUNDRY was found to be most interesting as it carried me back to my itinerant days around the turn of the century.

I have missed the pleasure of a personal contact with Mr. Forbes, but have shared comradeship with a number of his earlier contemporaries. To whose names may be added those of the late Dr. Moldenke, Thomas D. West, John Penton and other foundry-minded men as well as that of the illustrious Pat Dwyer of a later period.

Looking back over my experience in the field of industry and education I feel much as Mr. Forbes has put it. "Foundry patternmaking is perhaps the least understood today of most mechanical or metal trades and therefore not given its full share of recognition."

This lack of clearness may be due in part to the fact that a pattern is a means (tool used) to an end, not in itself a finished product.

HERBERT J. MCCASLIN
40 *Gifford Ave.*
Jersey City, N. J.

* * *

Tin Research Institute

TO THE EDITORS:

From the February 1956 edition of FOUNDRY, page 105, we learn that the Tin Research Institute has issued a publication called "How To Make Improved Chill Cast Tin Bronzes." As we don't know the address of said institute and we are interested in this line of production, we should like you to forward the address.

HENRY GUNNULFSEN
Skiens Jerstoperi
Skien, Norway

Editor's Note: Offices of the institute may be reached as follows: Tin Research Institute, Fraser Rd., Greenford, Middlesex, England; Centre d'Information de l'Etain, 31 Rue de Marais, Brussels, Belgium; N. V. Billiton Maatschappij. (Commerciele Dienst) Louis Couperusplein 19, the Hague, Holland; Tin Research Institute Inc., 492 West Sixth Ave., Columbus 1, O.

* * *

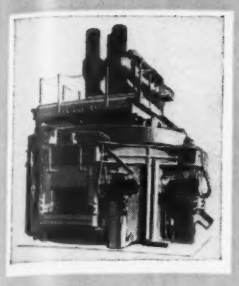
Seeks Old Volume

TO THE EDITORS:

You are aware that certain of the early producers of malleable iron practiced varying means of deception to restrain workers and others from acquiring a knowledge of the conversion process. Then there followed a period when operations were more scientific but so-called trade secrets were zealously guarded. While some publicity was given to these matters from time to time, not much can be deduced from such mentions.

A publication around 1897—*Plain Talk with Foundrymen*—appears to deal with the subject of trade secrets specifically, namely a treatise (published probably) by J. F. Boynton & Co., Rock Island, Ill. A page ad about it was run in the April 1897 issue of FOUNDRY, page 19. I think the contents of this publication would be of help to me in collecting historical data on the industry, and I

• ONE OF A SERIES OF MESSAGES TO MODERN FOUNDRY MANAGEMENT



SWINDELL

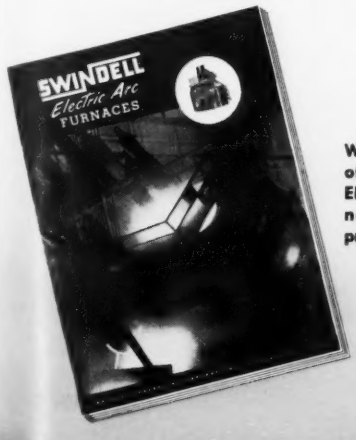
SINCE 1850

FOUNDRY ELECTRIC MELTING FURNACES

REMOTE CONTROLLED ELECTRODE HOLDERS

—another SWINDELL quality feature

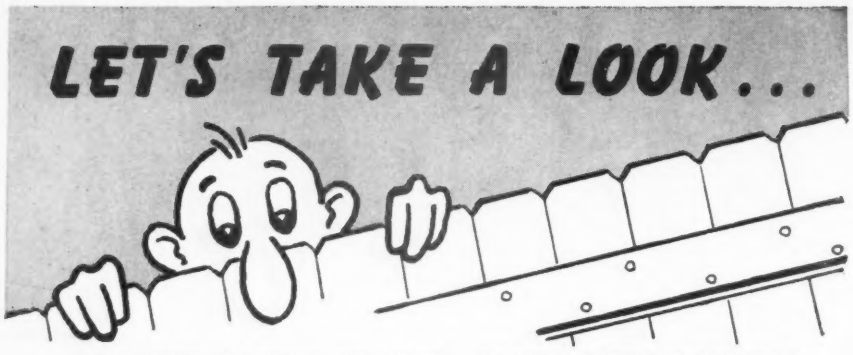
Swindell Electric Melting Furnaces for foundry service provide the productivity, low maintenance and long useful life built-in by genuine steel mill design and construction by steel mill melting furnace specialists. Write for a consultation.



WRITE for your copy of the latest Swindell Electric Melting Furnace Catalog—sent promptly on request.

SWINDELL electrode holders are remote-controlled from a floor position—with safety and convenience. The operating mechanism is simple and sturdy, eliminating interruptions to the melting cycle. In every respect, Swindell engineering produces crossheads, electrode arms and holder assemblies that function with smoothness, ease and dependability—measures of *quality* in exacting service.

SWINDELL-DRESSLER
CORPORATION
Designers and Builders of Modern Industrial Furnaces
PITTSBURGH 30, PA.



AT THE LATEST IN DRY SAND RECLAMATION!

Consider These Facts:

- HORIZONTAL FLOW (LOW HEAD SPACE)
- SIMPLIFIED MAINTENANCE (5 MIN. TUBE CHANGEOVER)
- CENTRIFUGAL ATTRITION SCRUBBING (Minimum Breakage)
- HIGH QUALITY AT LOW COST
- GREATER VERSATILITY FOR RECLAIMED SAND USE

AIR-RECLAIM WILL DO A JOB AND ADD TO YOUR FOUNDRY'S PROFIT!

Designed for low cost quality/quantity production of reclaimed sand with automatic operation, simple, selective controls and minimum maintenance cost.

Contact us for literature, or call upon our staff of trained Reclamation men for more specific information.

IT'S THE SPIN THAT DOES THE JOB!
FOUNDRY SAND
AIR-RECLAIM
RECLAMATION EQUIPMENT
"Reclamation is our business .. NOT A SIDE LINE!"

FEMA MEMBER FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC.

HYDRO-BLAST 10265 FRANKLIN AVE. FRANKLIN PARK, ILL. Franklin Park Phone GLadstone 5-3212 Chicago Phone NAtional 2-5770

have tried to obtain a copy from different sources without avail. The book is not indexed by the Library of Congress so it was not copyrighted.

If you can assist me in locating a source of a copy of the treatise I will be greatly indebted to you for your aid and co-operation.

ROBERT E. BELT

Malleable Founders' Society
Union Commerce Building
Cleveland 14, *Ohio*

Editor's Note: Do any readers have a copy of this old treatise?

* * *

Offers Corebaking Trick

TO THE EDITORS:

I am enclosing a photo of what I think is the trick of tricks. When making large cores which are to be baked on iron plates and the plate side must be smooth and dry, trowel the plate side, then cover with smooth

paper like that used in FOUNDRY. Set the core on the plate and bake. Core will be dry and smooth with a lot less baking.

The procedure also can be used on any core to speed baking and produce a dry plate side. In a vertical oven where heavy cores usually are run around twice, the placing of paper between the core and the plate often will permit the core to be removed, completely dry, after the first pass.

This is a very old trick but is known by few foundrymen. I hope the idea helps someone.

CLARRY BEYER

165 *Lorraine Ave.*
Neenah, Wis.

* * *

How Many Castings?

TO THE EDITORS:

Have read with much interest the article by C. W. Ammen on "How Many Castings in a Flask?" (March issue.) It is one of the best we have read on the subject.

Would appreciate receiving four copies.

N. LEVINSOHN
Foundry Superintendent

Lake Street Plant
Minneapolis-Moline Co.
Minneapolis 1

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When you use FRONTIER 40-E Aluminum Alloy!

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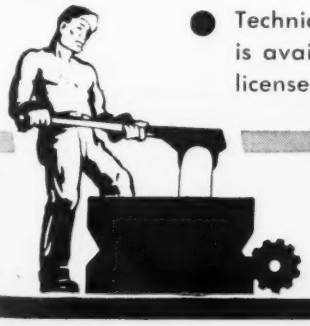

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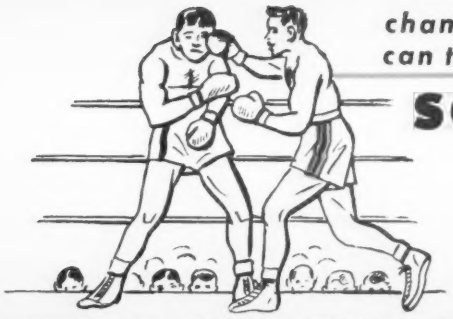

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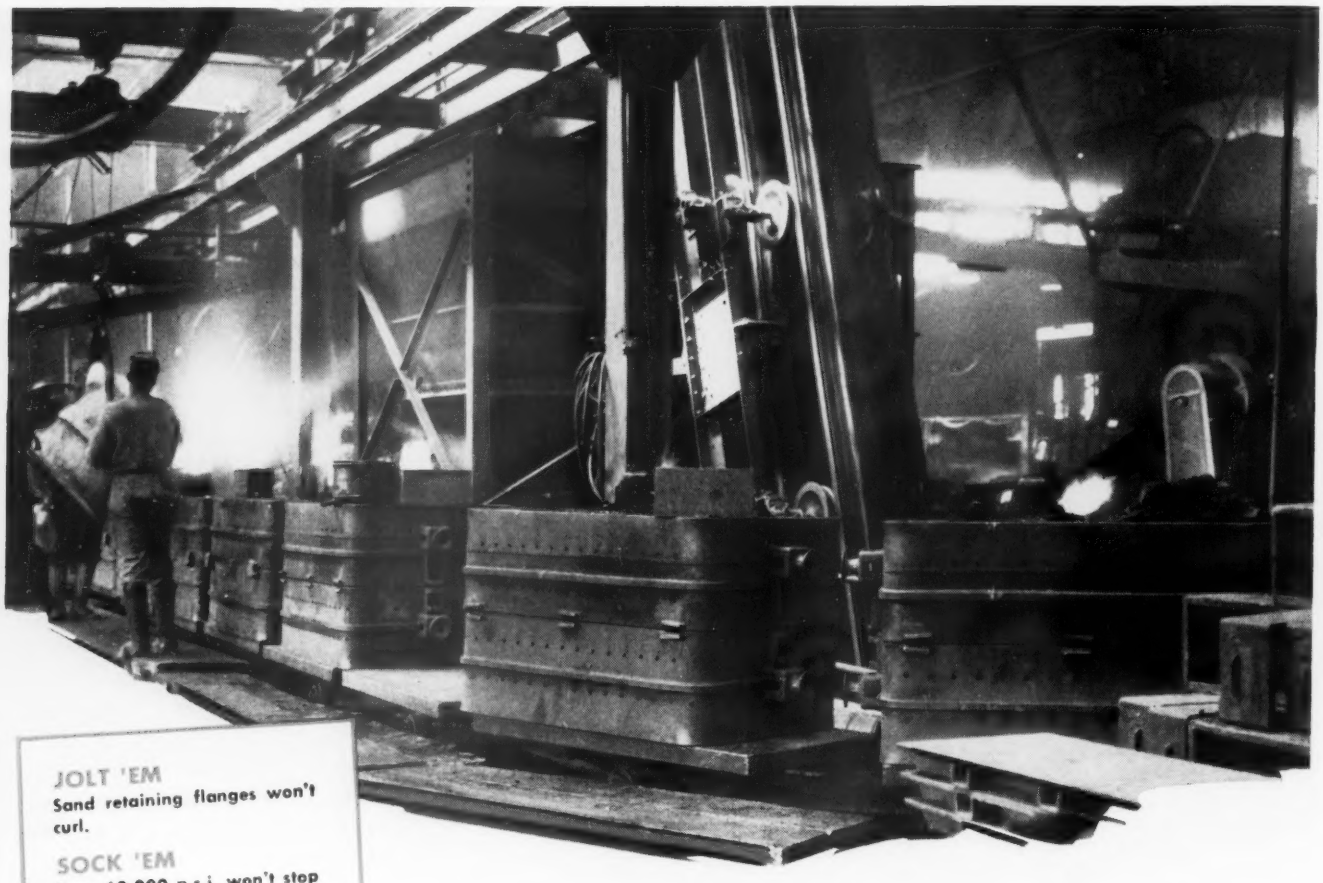
SO CAN

Sterling FLASKS



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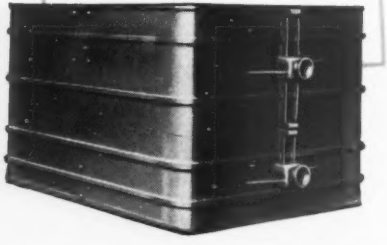

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PIONEERS IN THE MANUFACTURE OF FOUNDRY FLASKS

An Eye to the Future

The chart at the left was featured on the cover of our May issue. It illustrates the curve of castings shipments over the past ten years, shows the trend line for that period and projects the line for a few years ahead.

It is interesting to note that this projected line checks accurately with predictions of castings demand which have been made by government groups studying the future growth of the country and its industries. The trend line illustrates dramatically the possibilities for expansion of the market for castings, providing the industry can make as much progress in the future as it has during the past decade.

That the foundry and allied industries are awake to the potentials of market development seemed apparent at the recent Atlantic City convention and show, staged successfully under AFS sponsorship. Everyone visiting the tremendous display of foundry equipment and supplies must have been impressed with the progress that has been made in the production of castings. Much is being done to make better castings at a lower cost. Better methods and new and improved machines are meeting the challenge of rising labor costs and labor shortages in times of high production. New processes, better control and new products are helping to extend the market for castings.

Exhibitors reported exceptionally high interest from an unusually good attendance of foundry executives. Plans for further modernization and mechanization are being considered by many plants. Some are bringing out proposals which have been held in abeyance for some time.

The foundry industry has made remarkable strides in building and rebuilding its facilities since the end of World War II. But the job has not been completed, and from the enthusiasm of foundry executives, it will continue at a lively pace.

Yes, foundrymen are aware of the future market and are preparing to meet the demands.

Frank G. Steinebach
Editor

FRANK W. SHIPLEY
President

Heavy attendance marked many of the technical sessions

Papers and Exhibit Depict Progress at

AFS CONGRESS

HARRY W. DIETERT
Vice President

AN IMPRESSIVE record of recent progress in casting techniques, equipment and materials was provided the more than 13,000 visitors who attended the American Foundrymen's Society's Congress and Show at Atlantic City, May 3-9.

Convention Hall offered a dual attraction in a comprehensive program of technical papers and an extensive exhibit of the most modern foundry equipment and supplies. And both the technical discussions and the exhibits revealed numerous instances in which methods and facilities have been made available for the more efficient production of higher quality castings.

The technical program gave wide treatment to recently developed operating practices. Fundamentals and standard procedures, however, received equally good coverage at the various shop course sessions sponsored by the Brass and Bronze, Malleable, Gray Iron and Sand Divisions.

Annual Business Meeting—In a departure from past custom, the annual AFS business meeting was held in conjunction with a luncheon. President Bruce L. Simpson presided and announced that the

Over-all view of the extensive display of foundry equipment and supplies in Atlantic City Convention Hall

Opening day visitors line up to register. The Congress attracted more than 13,000

society membership had increased by 1500 during the past year to 12,400 members. Three new chapters were added—Connecticut, New England and Pittsburgh.

Officers and Directors—Election of new officers and directors selected by the nominating committee was announced by William W. Maloney, general manager.

Frank W. Shipley, vice president of the society last year, succeeds Mr. Simpson as president. Mr. Shipley is foundry manager of Caterpillar Tractor Co., Peoria, Ill., with which he has been associated since 1929. Graduated from Purdue University in 1921, he was with the Studebaker Corp., South Bend, Ind., for four years and later was foundry metallurgist at Lakey Foundry & Machine Co., Muskegon, Mich., and at Fairbanks, Morse & Co., Beloit, Wis.

Harry W. Dietert, new vice president of AFS, is board chairman of Harry W. Dietert Co., Detroit. Mr. Dietert was graduated from Iowa State College in 1920, and for a short time was an instructor at Rice Institute, Houston, Tex. He then became research engineer with U. S. Radiator Corp., Detroit, and later was chief engineer. Mr. Dietert left U. S. Radiator in 1936 to devote full time to his own company, of which he was president until two years ago. Active for many years in the AFS Sand Division, Mr. Dietert was awarded the society's McFadden gold medal in 1940.

These seven new directors have been named to three-year terms:

Roger W. Griswold Jr., superintendent, foundry division, Erie Malleable Iron Co., Erie, Pa., entered the foundry industry after his graduation from the Babson Institute of Business Administration, Boston, in 1939. Joining the Griswold Mfg. Co., Erie, he became foundry superintendent there in 1943 and vice president in 1946. He has been with Erie Malleable since 1949. Mr. Griswold was one of the organizers and first chairman of the Northwestern Pennsylvania Chapter of the AFS.

Herbert Heaton, foundry superintendent, Letson & Burpee Ltd., Vancouver, Canada, is a charter member and past chairman of the British Columbia Chapter. Educated in Calgary and Edmonton,

New AFS Directors

ROGER W. GRISWOLD JR.

HERBERT HEATON

GARNET P. PHILLIPS

Alberta, he is also an ICS graduate in industrial metallurgy. Mr. Heaton started in the foundry industry as an apprentice molder in 1935 in Edmonton and was appointed foundry superintendent of Heaps Engineering, New Westminster, B. C., in 1945. He left there in 1950 to take his present position in Vancouver.

Garnet P. Phillips, general supervisor, foundry research, International Harvestor Co., Chicago, was graduated from Rose Polytechnic Institute in 1925 and received his master of science degree from Carnegie Institute of Technology in 1926. He was with Frank Foundries Corp., Moline, Ill., as metallurgist and chief chemist, until 1935 when he joined International Harvester Co. as metallurgist. He is a past chairman of the Chicago Chapter.

Alex W. Pirrie, vice president of manufacturing, Standard Sanitary & Dominion Radiator Ltd., Toronto, Ont., is a past chairman of the Ontario Chapter of AFS. After serving as an apprentice pattermaker with Canadian National Railways, Montreal, Mr. Pirrie was with Warden King Ltd. and Crane Ltd., Montreal, from 1929 to 1937, when he joined Gurney Foundry Co., Montreal. Following wartime service with Electric Steels Ltd., Three Rivers, Que., he returned to Gurney at Toronto. In 1950 the latter was taken over by Standard Sanitary & Dominion Radiator Ltd.

R. V. Righter, plant manager of the Danville, Ill., plant of Central Foundry Division, General Motors Corp., was graduated from the University of Illinois in 1935. He joined General Motors in 1943 as assistant personnel director of the Saginaw Malleable Iron Plant, and was made divisional personnel director in 1945. In 1950, Mr. Righter was named plant manager at Saginaw. He was transferred to Danville three years ago.

Gerald R. Rusk, president, Freeman Supply Co., Toledo, O., is a past chairman of the Toledo Chapter of AFS. Active for 27 years in the foundry and pattern supply and equipment industry, he has been president of Freeman Supply Co. for the last 9 years.

A. V. Martens, who was appointed a director to serve for three years, is president, Pekin Foundry & Mfg. Co., Pekin, Ill. Mr. Martens has been active in foundry organizations, being a past chairman of the Central Illinois Chapter, AFS, past president

One of several displays at Convention Hall describing research projects being conducted by the various divisions of the society

S. C. Massari presenting the Hoyt Memorial Lecture

ALEX W. PIRRIE

R. V. RIGHTER

GERALD R. RUSK

A. V. MARTENS

of the National Foundry Association and a past vice president of the National Castings Council.

Bruce L. Simpson, president, National Engineering Co., Chicago, as retiring national president becomes an AFS board member for one year.

Apprentice Contest—The society's 33rd annual competition for apprentices, now known as the Robert E. Kennedy Memorial Apprentice Contest, attracted a record number of entries. In announcing the national winners, Mr. Maloney reported that this year there were 431 participants from 153 companies, compared with the previous high of 365 entries in 1955. Individual contests were sponsored by 15 chapters.

First-place winners in the five divisions of the contests were present to receive their certificates and $100 awards from President Simpson. First, second and third places, respectively, in the five classifications were won by the following:

Wood Patternmaking—Herbert Nelson, Pacific Pattern Works, Tacoma, Wash.; Ed Poole, Washington Iron Works, Seattle, Wash.; Lewis Backus, Cleveland Standard Pattern Works Inc., Cleveland.

Metal Patternmaking—Herbert L. Zigler, Motor Patterns Co., Cleveland; Stanley Stobierski, Cove Pattern Works Inc., Cleveland; James A. Smith, Annex Pattern Co., Detroit.

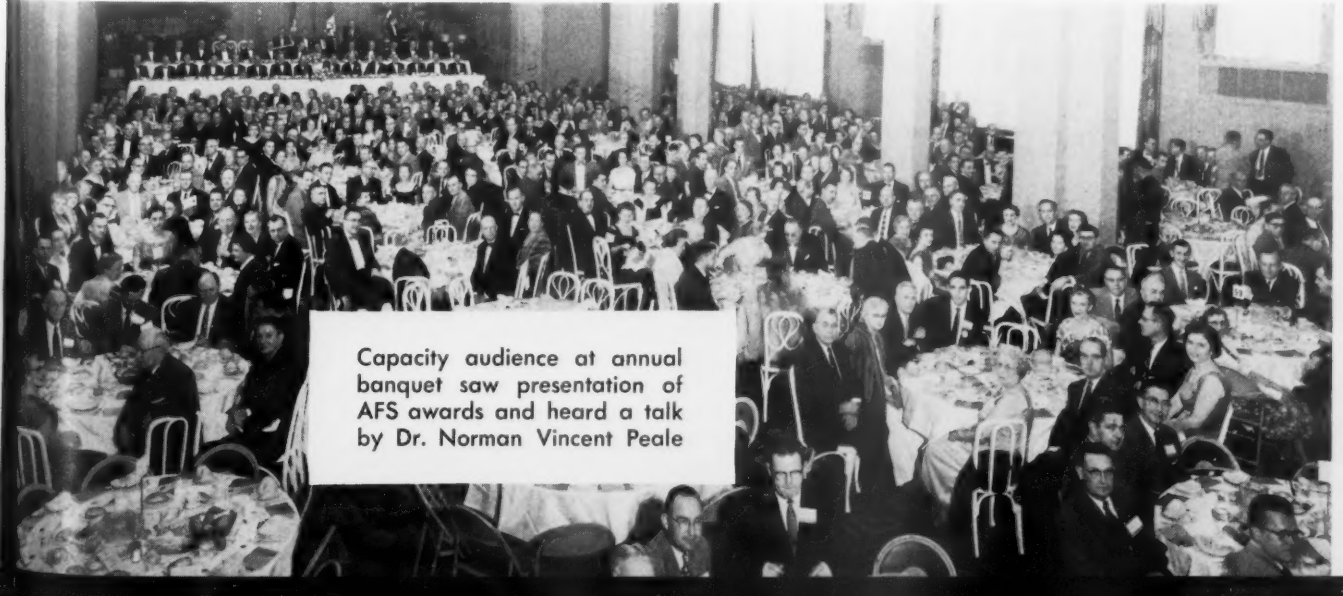
Iron Molding—Stanley R. Varr, Brown & Sharpe Mfg. Co., Providence, R. I.; Eugene Calhoun, Howell Foundry Co., Los Nietos, Calif.; James R. Walton, Caterpillar Tractor Co., Peoria, Ill.

Steel Molding—Mert West, Ohio Steel Foundry Co., Springfield, O.; Joseph Zohil, Dodge Steel Co., Philadelphia; Jesse Lawson, Continental Foundry & Machine Division, East Chicago, Ind.

Nonferrous Molding—Donald Tetzlaff, Allis-Chalmers Mfg. Co., Milwaukee; Raymond Montano, Ampco Metal Inc., Milwaukee; Arthur Berge, St. Catharines Brass Works, St. Catharines, Ont.

Chairman of the Education Division, William H. Ruten, Polytechnic Institute of Brooklyn, Brooklyn, N. Y., spoke briefly, paying tribute to the apprentice contest entrants and their companies.

Hoyt Lecture—Every foundry should have some form of marketing program, declared S. C. Massari, director of research, National Engineering Co., Chicago, in his Charles Edgar Hoyt Memorial Lec-



Capacity audience at annual banquet saw presentation of AFS awards and heard a talk by Dr. Norman Vincent Peale

ture. Entitled "Marketing Your Product," the lecture outlined methods by which new markets for castings can be developed.

Mr. Massari pointed out the importance for consumers to recognize the value of castings and for foundries to improve casting quality, develop new applications and satisfy increasingly rigid specifications to meet competition from other manufacturing methods and materials. To illustrate the potentialities of product development, the speaker cited numerous examples where a change in design and application of good foundry engineering or new foundry technique have replaced less desirable methods of manufacture.

Procedures for effective marketing of castings were discussed under the elements of planning, sales effort, advertising and new product development. In many respects, market analyses are not nearly as difficult as most foundrymen presume, Mr. Massari said. Various types of directories can help provide a list of potential casting users from which personal follow-up can develop a file of prospective customers.

Because selling castings is an engineering job, the foundry technical staff should assist in working out engineering details with the customer's design engineers. And while the foundry's primary contact with any customer is the casting buyer, it is equally important to have close relationship with the design engineer.

Advertising is an important part of a marketing program because it helps reduce the cost of selling by salesmen. Mr. Massari described the various forms of effective advertising, including use of magazines, catalogues, brochures, direct-mail material, open-house at the plant and exhibits at industrial shows.

In conclusion, Mr. Massari stressed the importance for the foundry to know its product. "Explore and sell it energetically on its merits; understand its deficiencies and don't misapply them, for to do so hurts the future of your business as well as that of all other foundries."

Annual Banquet: A capacity crowd filled the American Room of Hotel Traymore on Friday evening for the AFS Annual banquet. President Bruce L. Simpson presided and introduced the members of the society's board of directors.

Gold medals and honorary life memberships awarded by the AFS Board of Awards were presented by Fred J. Walls, a past president. Recipients of life memberships were William D. McMillan, International Harvester Co., Chicago; Joseph C. Pendleton, retired superintendent of the Pattern and Foundry Division, Newport News Shipbuilding & Dry Dock Co., Newport News, Va.; and Bruce L. Simpson, National Engineering Co., Chicago. Harold F. Bishop, Naval Research Laboratories, Washington, was presented the Joseph S. Seaman gold medal; Charles C. Sigerfoos, Michigan State University, East Lansing, Mich., was the first recipient of the newly established Thomas W. Pangborn gold medal; and James S. Vanick, International Nickel Co., New York, received the William H. McFadden gold medal.

The audience greeted the guest speaker, Dr. Norman Vincent Peale, as an old friend. Undoubtedly they had known him before either as minister of Marble Collegiate Church, New York, as the author of two best-sellers or through his radio and television programs. Dr. Peale outlined, with many amusing anecdotes to illustrate his suggestions, how anyone can increase his efficiency through right thinking.

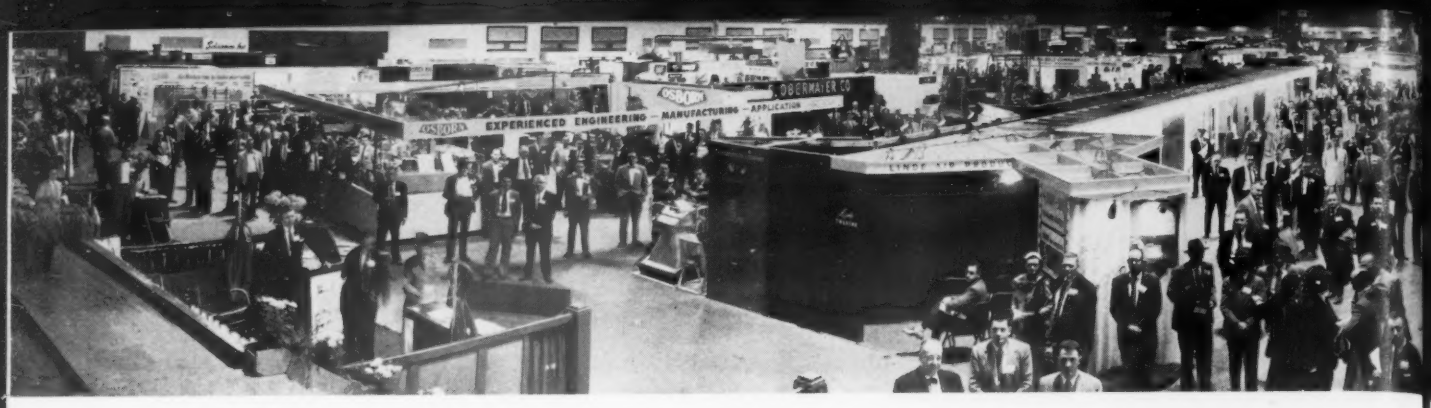
The annual Alumni dinner was unusual in that 16 past presidents of the society were present. Past-president plaques were presented to all of those present, and were sent to those who were unable to attend, including William H. McFadden, Forth Worth, Tex.—the oldest living past president, who served in 1906-07—and Benjamin D. Fuller, Rocky River, O., who served in 1917-18. The oldest living past president in attendance was Wyndham R. Bean, Staunton, Va., who served two terms in 1920-22.

Reports on technical papers presented at Atlantic City start on page 174.

Speaker's table, above and left, at the annual business meeting luncheon

President Bruce L. Simpson, General Manager W. W. Maloney and Frank W. Shipley, incoming president, at annual meeting

Apprentice Contest Committee Chairman Roy W. Schroeder (center) examines entries with the top prize winners: S. R. Varr, Herbert L. Zigler, Mert West, Donald Tetzlaff and Herbert Nelson



There Was Much To See at

AFS FOUNDRY SHOW

VISITORS at the AFS Show in Atlantic City found much to occupy their attention. As a whole, the exhibit set a new high standard in the attractiveness and effectiveness of the displays. More equipment was in operation than ever before. And the numerous new or improved products shown added considerably to the general interest.

Molding—Molding machine exhibits generally featured refinements. Centralized controls for operator convenience and faster production were much in evidence. Control mechanisms are enclosed for protection against sand and dirt.

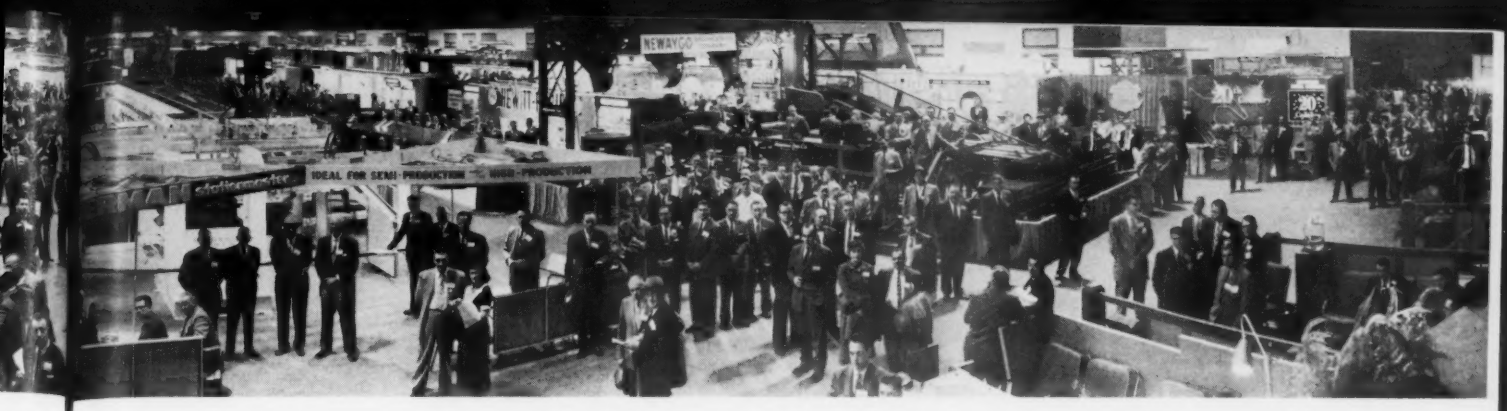
One manufacturer showed interchangeable units designed for flexibility in setting up and adapting molding systems to varying requirements. Heart of the equipment is a jolt-rollover machine which can be incorporated with roller conveyors, transfer cars and push-off devices into an integrated system of mold handling.

A four-station rotary mold blowing machine on display blows a cake of sand, called a mold preform, onto the pattern plate at one station. At the next station this preform is raised into a flask and on up to the squeeze head. The mold preform principle is said to avoid blow-outs—a possibility with worn flasks—and the tight seal between blow chamber and pattern plate reportedly gives good sand packing.

One automatic unit is an indexing jolt-squeeze-strip machine which strips and pushes off a mold at one station while a flask is being rammed at the other station. The machine may be equipped with one or two squeeze heads to allow production of different patterns or cope and drag patterns.

Another blow-squeeze machine has a three-station turntable and automatic mold stacking unit. Flasks may be fed automatically to the machine at one station. They are blown at the second station and automatically removed and stacked at the third.

Mold stacking operations also were performed by a jolt-squeeze machine using snap flasks. A



thin metal jacket placed between flask and mold serves to align the molds for pouring. The flask is removed from each mold section as it is stacked.

A diaphragm molding machine exhibit featured use of slotted patterns for CO_2 hardening of the mold by pushbutton operation after the squeeze. Molds can be made entirely of silicate-bonded sand, or that sand can be used only in sections of the mold to obtain a built-in core or added strength in critical areas.

Coremaking—Operating displays showed production of resin-bonded solid cores, shell cores, cores made with cold-type binders, oil-bonded cores and CO_2-hardened cores. Equipment included conventional coreblowers, shell coreblowers and core shooters, which have achieved considerable popularity in Europe. One exhibitor produced 8-lb cores from a mixture of silica sand, 2 per cent thermosetting liquid urea resin and 1 per cent water, mulled for four to five minutes. These cores were cured in 45 seconds by the application to the corebox of compressed air at 400°F.

Shell and CO_2 Processes—The 16 exhibitors of shell molding equipment and supplies are indicative of the growth in the process. Six years ago at the AFS Show in Cleveland there was one exhibitor. New and improved manual, semiautomatic and automatic units of both blow and dumpbox types were on display and operating. Combination mold and core blowing machines were shown along with some new units for hot or cold processing of sand with either dry or liquid resin. Improved fusers for bonding shell halves also were exhibited.

Unusual interest continued to be shown in the CO_2 process and the equipment required for its application. Core and mold blowers, sand mixers, binders and gassing apparatus for use with the process for sand hardening were on display.

Investment Casting—A new investment casting technique using glass powder molds was introduced at the show. Shells $\frac{1}{8}$ to $\frac{1}{4}$-in. thick are made by dipping a wax pattern into a glass powder slurry and subsequently coating it with layers of silica glass grains. The pattern is removed by degreasing or melting. This produces a strong shell said to withstand metal temperatures up to 3300°F and to produce castings with tolerances of 0.005-in. per in.

Melting—An indicated trend in cupola melting of large tonnages is toward water cooling above the tuyeres. This permits elimination of lining, or use of only an extremely thin lining in that area, with a carbon lining below. Hot blast generally is employed with water cooling. Some of these cupolas reportedly have operated for two weeks without dropping the bottoms. Several models of a German recuperative type hot-blast cupola were exhibited.

Under consideration is the development of a natural gas-fired forehearth or mixer for use with a cupola to maintain iron at high temperature.

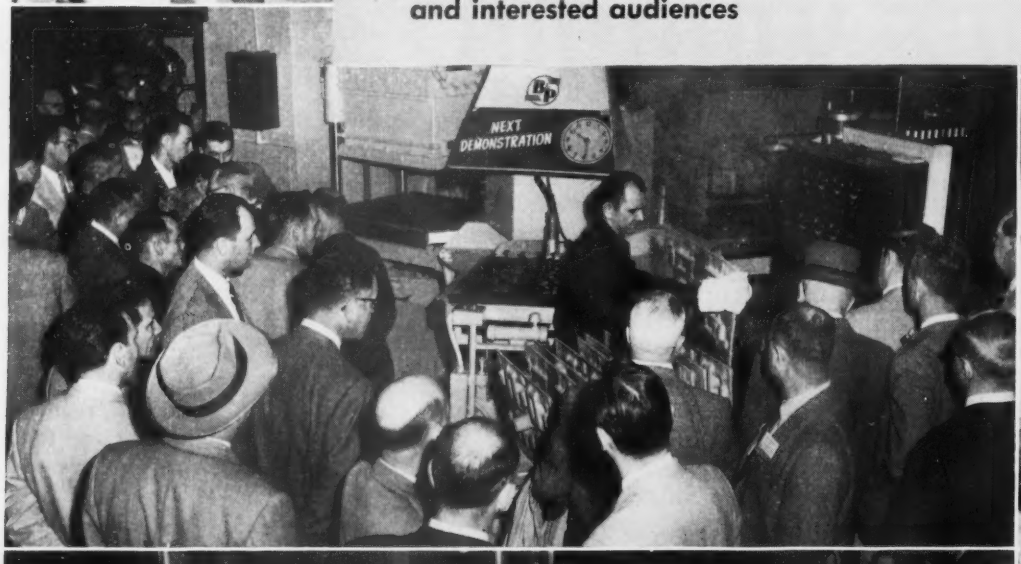
Sand Systems—A new type of automatic sand moisture control was shown. It adds water while the sand is being mixed. Additions are made in three stages with no increase in mulling time.

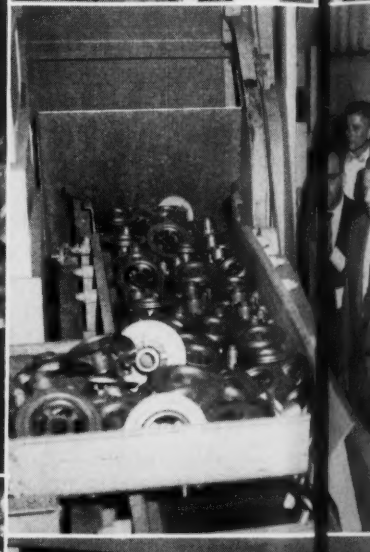
Among sand preparation and handling equipment displayed was a new unit combining a muller, elevator, aerator and overhead molders' hoppers in the one system.

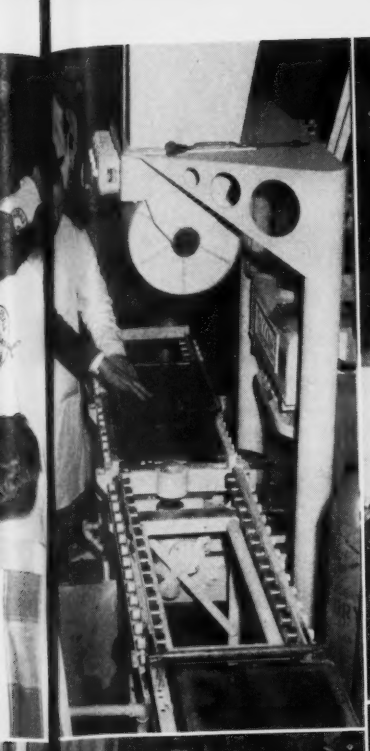
New among sand reclamation units was a dry scrubber which employs centrifugal force to provide grain-to-grain contact and abrasion. The scrubbing action separates coatings of spent binders from the surfaces of individual sand grains.

Men and Machines

Operating exhibits, of which there were many at Atlantic City, invariably attracted large and interested audiences







FEMA

SUTTER

ZIRCONIUM

. . . in Cast Iron

Mr. Brandler's article appeared originally in a recent issue of Pig Iron Rough Notes, a publication of United States Pipe & Foundry Co.

By E. A. BRANDLER
Metallurgical Engineer
Electro Metallurgical Co.
Division of Union Carbide & Carbon Corp.
Birmingham

ONLY in recent years has zirconium become an important aid to the iron foundry, although it has been added to cast iron ever since it became commercially available. The available alloys of zirconium are principally silicon-iron-zirconium or a variation of such alloy in the presence of additional elements.

Perhaps the first and most widespread use of zirconium in cast iron is its use as a key element in SMZ alloy, a widely used ladle inoculant. In this application, zirconium increases tensile strength and transverse strength, reduces chilling characteristics, and promotes the formation of pearlite and normal flake graphite. Irons subject to inoculation usually have a carbon equivalent of 4.10 per cent or less.

Zirconium for ladle inoculation is usually added in dilute form and in small amounts. The best-known alloy is of the manganese, silicon, zirconium type. This alloy contains 60/65 per cent silicon, 5/7 per cent manganese, 5/7 per cent zirconium and approximately 20 per cent iron. The normal ladle addition of the alloy is from 2 to 6 lb per ton of iron.

Literature on ladle inoculation is so extensive that no further attempt will be made to pursue this subject. It is worthy of mention, however, that ladle inoculants containing zirconium retain their inoculating power for far greater lengths of time after being added than do inoculants of other compositions. Very little fading is observed even after a half-hour when inoculating with alloys of the zirconium type.

Effects of Zirconium On Graphite Type—While zirconium when used in small amounts as an inoculant was described as promoting the formation of normal flake graphite, zirconium under different conditions can promote the formation of eutectiform and nodular graphite as well.

Morrogh and Gardner[1] found that zirconium additions of about 0.20 per cent zirconium promoted the formation of eutectiform graphite in eutectic or hypereutectic irons.

Jeffery[2] and others in unpublished investigations found small quantities of nodular graphite in low-sulphur hypereutectic irons treated with large additions of zirconium. The zirconium addition was 0.30 per cent to 0.40 per cent. So far as is known, no investigator has ever been successful in producing a 100 per cent nodular graphite iron with zirconium alone. Many have used zirconium along with other nodulizing agents such as cerium

TABLE I—Machinability of Basic Cupola Heats

Specimen No.	% TC	% Si	% Mn	% S	% P	% Zr[a]	Hardness[c]	DTM[d]	Remarks
C-19-7	3.54	3.25	0.58	0.017	0.71	...	B-82	52.7	Untreated base iron
C-19-8	....	....	....	....	....	0.022	B-75	60.5	0.5% addn. Zr-Fe-Si[b]
C-19-9	3.51	3.56	0.58	0.015	0.68	0.107	B-73	75.0	1.0% addn. Zr-Fe-Si
C-19-10	....	....	0.58	....	....	0.119	B-70	84.0	1.5% addn. Zr-Fe-Si
C-22-5	3.87	1.56	0.61	0.011	0.55	...	B-88	53.9	Untreated base iron
C-22-6	3.81	1.78	....	0.011	....	0.051	B-84	65.2	0.5% addn. Zr-Fe-Si
C-22-7	3.82	1.83	0.59	0.011	0.54	0.048	B-82	68.3	1.0% addn. Zr-Fe-Si
C-22-8	3.78	2.15	....	0.010	....	0.122	B-82	92.6	1.5% addn. Zr-Fe-Si

[a] Residual Zr content. [b] Zirconium added as 13% zirconium-ferro silicon. [c] Rockwell "B" scale 1/16-in. diam steel ball 100-kg load. [d] Drill test machinability, mm penetration per minute.

TABLE II—Zirconium as a Sulphide Former

Ladle No.	Addition	Si	S	Mn	P	C	Zr	TS in psi	Bhn	Chill* Depth
I-714-1	.60 Si as 75% FeSi	2.08	.203	.22	.55	3.46	>.01	31,800	241	.25
I-714-2	1.50% ZrSi (12-40)	2.10	.202	.23	..	..	.055	39,100	201	.12
I-714-3	.60% as 75% FeSi .50% Mn as FeMn**	2.08	.212	.79	..	....	>.01	32,400	212	.08

*Chill depth to first gray in inches. **Crucible additions.

TABLE III—Sulphur Neutralization by Zirconium Additions

Heat No.	Composition, % T.C.	Si	P	S	Mn	Zr Added %	Bhn, Bar Section, in. ½	¾	DTM* ¾-in. Section Step Bar
30A	3.48	1.37	0.04	0.120	0.36	None	212	212	36.3
30B	3.33	2.23	0.04	0.116	0.36	0.1	159	140	45.9
30C	3.29	2.89	0.04	0.108	0.36	0.2	131	126	60.0
30D	3.40	2.09	0.04	0.102	0.36	0.3	166	159	41.6
30E	3.24	2.75	0.04	0.098	0.34	0.4	163	137	39.6
31A	3.41	1.23	0.04	0.213	0.40	None	217	228	Unmachinable
31B	3.31	2.25	0.04	0.198	0.40	0.1	202	217	37.9
31C	3.28	2.80	0.03	0.211	0.40	0.2	192	153	50.0
31D	3.35	1.96	0.03	0.198	0.40	0.3	202	207	35.6
31E	3.31	1.89	0.04	0.196	0.40	0.4	207	223	32.5

*Drill test machinability, mm penetration/min.

Similar results were obtained when the 13% iron-silicon-zirconium alloy was added as a ladle inoculant or as briquet to the charge in cupola heats. Here the recovery of zirconium was about 75% when added to the ladle, and 30% when added to the charge in the cupola.

and magnesium to make completely nodular iron.

Because zirconium combines readily with nitrogen, oxygen, sulphur and carbon, dilute alloys of zirconium are sometimes preferred for introducing zirconium into cast iron. An alloy of 13 per cent zirconium, 40 per cent silicon, remainder iron is sufficiently dilute so that adequate solution rates are obtained if the alloy is properly sized before the addition is made and molten iron has a sufficiently high temperature. The 13 per cent zirconium alloy is the one now generally used for sizable zirconium additions to cast iron. The 13 per cent zirconium alloy is also briquetted.

Effect on Machinability—The foundryman has always been interested in improving the machinability of cast iron. Several investigators have found that zirconium has a profound influence on cast iron machinability

Austin[3], while looking for a method to improve machinability of high-phosphorus cast iron, made a comprehensive study of machinability and machinability-improving elements. He found that additions of 0.13 to 0.15 per cent zirconium to a desulphurized iron (0.02 per cent sulphur or less) increased the machinability of the base iron 40 to 45 per cent.

Austin found that SMZ alloy additions to cast iron promoted the formation of ferrite and by such additions, he was able to produce completely ferritic irons as cast. Desulphurization, however, is an essential part of the process. The machinability improvement lessens as sulphur is increased.

Austin, in his endeavor to develop a practical method for improving the machinability of high-phosphorus irons, also made a series of basic cupola heats to which zirconium was added in varying amounts. Basic cupola practice along with calcium-carbide in the charge offered a successful method for the production of low-sulphur irons, which is necessary for obtaining maximum advantage from Austin's method. The machinability ratings from these heats are shown in Table I.

While Austin's work is confined principally to low-sulphur irons, other observers adding zirconium to iron of normal sulphur content found an improvement in machinability but not nearly as great as recorded by Austin in low-sulphur irons.

One Birmingham foundry compared the machinability of irons treated with 75 per cent ferrosilicon, 13 per cent zirconium-silicon alloy, and iron as received from the cupola. The iron as received from the cupola contained 3.45 per cent carbon, 2.00 per cent silicon, 0.60 per cent manganese, 0.55 per cent phosphorus and 0.10 per cent sulphur. The drill penetration test was used for rating machinability. Ladle additions of 0.827 per cent ferrosilicon (75 per cent grade) increased machinability an average of 1.5 per cent. Ladle additions of 0.25 per cent of 13 per cent zirconium-silicon alloy increased machinability from 5 per cent to as high as 17 per cent.

Effect In Tying-Up Sulphur — The deleterious effects of sulphur in cast iron have been recognized and understood for many years. In combating it, manganese has been the traditional element used by the iron foundry, for manganese is a good sulphide former and has a greater affinity for sulphur than does iron when present in quantities at least four times the sulphur content.

Several investigators have found the efficacy of zirconium in tying up sulphur in cast iron exceptionally good, and a number of iron foundries are using zirconium for this purpose.

Donoho[4], in order to test the power of zirconium as

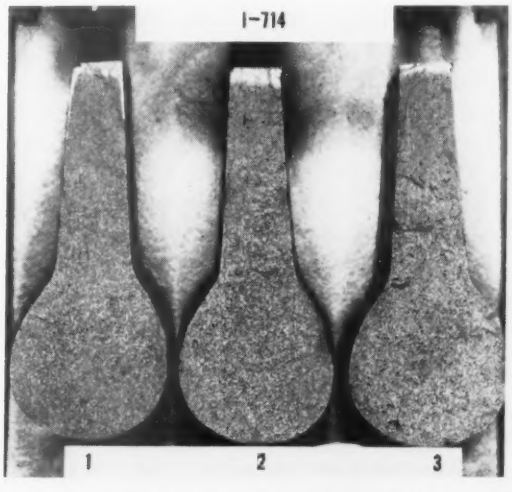


Fig. 1—In chill tests with high-sulphur, low-manganese heats, 13% Zr-Si alloy (heat 2) did a good job of desulphurizing without manganese

TABLE IV—Shrinking and Chilling Characteristics of Zirconium-Treated Gray Cast Iron

Heat No.	Chemical Composition—% Total Carbon	Combined Carbon	Mn	Si	Zr	Ti	Composition of Addition Alloy—% C	Mn	Si	Zr	Ti	Ca	Chill Depth in.	Color of Fracture	Shrinkage Depth in in. 4" cube
9589	3.46	0.52	0.58	1.81	...	No additions made							0.75	Gray	5/32
9590	3.41	0.71	0.58	1.76	0.21	...	0.13	...	55.56	27.80	...	4.90	0.09	Black	1/16
9621	3.52	0.60	0.48	1.79	...	No additions made							0.63	Gray	3/16
9624	3.40	0.68	0.50	1.83	0.17	...	0.58	...	55.35	25.13	...	4.88	0.06	Black	(a)
9629	3.18	0.56	0.46	2.24	0.21	...	0.58	...	55.35	25.13	...	4.88	0.38	Black	(a)
9674	3.58	0.63	...	1.90	0.18	0.19	0.62	7.18	45.83	15.94	13.94	4.06	0.38	Black	0

(a) Slight expansion on solidification.

a sulphide former in cast iron, devised a series of simple experiments. He made three induction furnace heats of cast iron, intentionally having a high-sulphur content, and as low a manganese content as possible, making sure that manganese-to-sulphur ratio was far out of balance. On the first heat only 75 per cent ferrosilicon was added for graphitizing. On the second heat only 13 per cent zirconium alloy was added. On the third heat 75 per cent ferrosilicon and enough ferromanganese to counteract the sulphur was added. This third heat was made for comparing the effectiveness of manganese and zirconium. The results are listed in Table II and the chills are shown in Fig. 1.

The data in Table II clearly indicate what occurs when the sulphur is high and the manganese is low. Tensile strength is low and the hardness and chill depth are high. It is apparent that only 0.055 per cent residual zirconium is sufficient to tie up the excess sulphur (ladle No. I 714-2). The low hardness and high tensile strength illustrate this point conclusively. Results on ladle No. I 714-3 show that while manganese is effective in tying up sulphur, it is probable that zirconium is superior. While the chill depth for the high-manganese heat is lower than for the zirconium heat, tensile strength is lower and hardness higher.

Jeffery[5] also tested the potency of zirconium in tying up sulphur but used a machinability and hardness method. He made a series of heats intentionally having high sulphurs and as low a manganese content as possible. To each heat, he added various amounts of the 13 per cent zirconium-silicon alloy ranging from 0 to 0.40 per cent zirconium. He then tested the hardness and drill penetration machinability of test bars from each heat. The results are listed in Table III.

From Table III it is obvious that increasing additions of zirconium up to approximately 0.20 per cent lowers hardness and increases machinability in the presence of high sulphur and low manganese. This is rather conclusive evidence that zirconium is extremely potent in tying up sulphur. The lowering of machinability and increase in hardness observed from zirconium additions of over 0.20 per cent probably indicate the beginning of the formation of zirconium carbides.

Effect On Fluidity—For some reason which is not very well understood, zirconium exerts an amazing influence on the fluidity of cast iron. While no published data are available on this subject, investigators such as Jeffery have reported a significant increase in fluidity, as measured by the AFS spiral, in zirconium-treated iron. The increased fluidity results from either ladle additions of the 13 per cent zirconium-silicon alloy or from cupola additions of the briquetted 13 per cent zirconium-silicon alloy.

Jeffery's[2] work indicates that low-phosphorus irons show more improvement in fluidity when treated with zirconium than do high-phosphorus irons. Jeffery[2] states that zirconium additions from 0.01 to 0.03 per cent are most effective in increasing fluidity. (See Fig. 2 for results of Jeffery's[2] work.) Jeffery[2] mentions further that in some cases he has been able to obtain fluidities in excess of 60 in. with zirconium additions.

Effect on Shrinkage Characteristics — A little-known property of zirconium in cast iron which has great potentialities is its effect on shrinkage.

Burgess[6] first noticed that zirconium additions noticeably reduced the shrinkage of cast iron. He found that in irons containing less than 0.10 per cent sulphur, zirconium additions resulted in an iron exhibiting very little shrinkage and in some cases iron that even expanded during solidification. (See Table IV.)

Jeffery[2] later had similar experiences and was able to produce irons exhibiting little or no shrinkage with zirconium additions. He also succeeded in producing irons which expanded upon solidifying. The potentialities of this application of zirconium are appreciable in the manufacture of hard-to-feed castings.

Jeffery[2] states that zirconium, when added in the proper amount, is capable of producing undercooled graphite in cast iron. He states that irons containing this particular type of graphite structure have been found to resist alternate heating and cooling and to exhibit little shrinkage tendency. In some cases zirconium-treated irons even expanded upon solidifying.

Jeffery[2] also states that it is quite obvious that this expansion characteristic of zirconium-treated iron would prove beneficial in creating internal soundness and in eliminating the need for excessive gating and risering.

Effect on Hardness—As mentioned earlier, zirconium in cast iron promotes the formation of ferrite at the expense of pearlite and as a result,

TABLE V—Zirconium Effect on Hardness

Zirconium Added %	Brinell Hardness
0.0	241
0.1	241
0.2	228
0.3	217
0.4	212
0.5	217
0.6	212
0.7	217
0.9	217
1.0	212

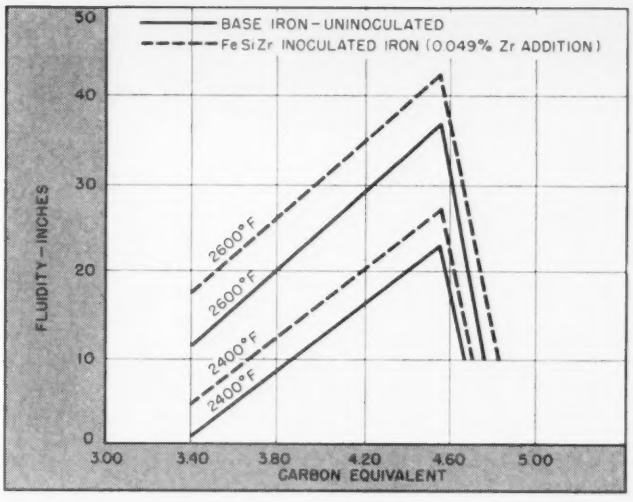


Fig. 2—Jeffery's work indicated that Zr improves fluidity more in low-phosphorus irons than in high-phosphorus irons

reduces the hardness of a base iron. Increasing amounts of zirconium result in decreasing brinell hardness values up to the point where zirconium carbides begin to form.

Riggan and Aufderhaar[7] studied the effect of zirconium additions on the hardness of a base iron. Results are shown in Table V, where it will be noted that increasing zirconium from 0 to 1.0 per cent decreased the brinell hardness from 241 to 212.

Jeffery made many unpublished studies of the effect of zirconium on the hardness of cast iron. One such study compared the hardness of test bars made from identical cupola charges except that one charge contained 5 per cent silicon briquets and the other contained 5 per cent zirconium-silicon briquets. Step down test bars were used. The charge containing zirconium showed reductions in brinell hardness of 10 points in the ¼-in. section, 18 points in the ½-in. section and 23 points in the ¾-in. section, compared with the other.

Effect on Strength—Zirconium additions to cast iron have a surprising influence on the strength of cast iron. The work of various investigators shows that increasing additions of zirconium increase transverse strength deflection and tensile strength of base irons.

Jeffery[2], in order to determine the effect of zirconium on the strength of cast iron, made a series of cupola heats under identical operating conditions and, making all heats of the same approximate analysis, added varying amounts of zirconium briquets to the cupola charge. The transverse strength, deflection and tensile strength were then determined. Results are in Table VI.

Zirconium as a Nitride Former—Recently several gray iron investigators have shown some concern about the possible deleterious effects of nitrogen in cast iron. The ability of zirconium to tie up nitrogen in steel has been used for many years.

While, to the writer's knowledge, no work has been attempted to determine the ability of zirconium to tie up nitrogen in cast iron, the writer believes that many of the unexplained effects of zirconium in cast iron may be due to the ability of zirconium to form a stable nitride.

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TABLE VI—Physical Properties of Zirconium-Treated Iron

Cupola Heat No.	Steel	Cupola Charge in Lb. Low-Phos Pig	High-Phos Pig	Fe Si (75%)	Fe Mn (80%)	Zirconium Briquets Number Used	Physical Properties-Avg. 3 Tests Transverse Strength, Lb.	Deflection in In.	Tensile Strength, psi
1*	25	37.5	37.5	1.92	0.00	0	1776	.217	24333
2*	25	37.5	37.5	1.28	0.00	½	1870	.238	25033
3*	25	37.5	37.5	0.64	0.00	1	1968	.229	28067
4*	25	37.5	37.5	0.00	0.00	1½	2422	.286	32175
5**	25	37.5	37.5	1.92	0.41	0	1990	.220	25700
6**	25	37.5	37.5	1.28	0.41	½	2115	.236	29400
7**	25	37.5	37.5	0.64	0.41	1	2287	.287	32250

*Calculated Analysis: C-3.36, Si-2.41, S-0.08, P-0.27, Mn-0.28 These heats contained insufficient manganese to neutralize sulphur.
**Calculated Analysis: C-3.36, Si-2.41, S-0.08, P-0.27, Mn-0.57 These heats contained sufficient manganese to neutralize sulphur.
Tests made on A.S.T.M. Type "B"—1.2" test bars. Results are averages of three or more tests.
Each zirconium briquet contained 1 lb of silicon and ¼-lb of zirconium.
Zirconium Additions—% Zr Added.

Heat 1 —No Zr added
Heat 2 —0.13% Zr added in charge—½ zirconium briquet
Heat 2 —0.25% Zr added in charge—1 zirconium briquet
Heat 4 —0.38% Zr added in charge—1½ zirconium briquet
Heat 5 —No Zr added
Heat 6 —0.13% Zr added in charge—½ zirconium briquet
Heat 7 —0.25% Zr added in charge—1 zirconium briquet

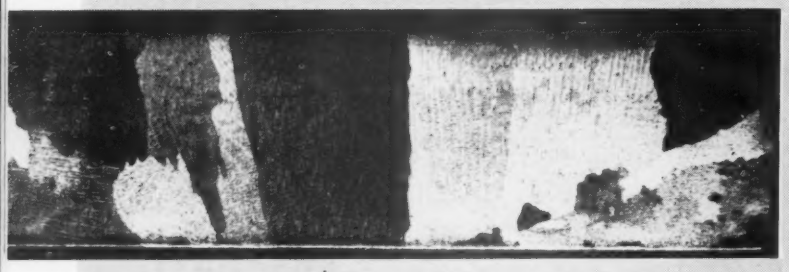

Fig. 1—Large grain size is evident in investment cast 310 stainless steel. 5X, Chrome Regia etch

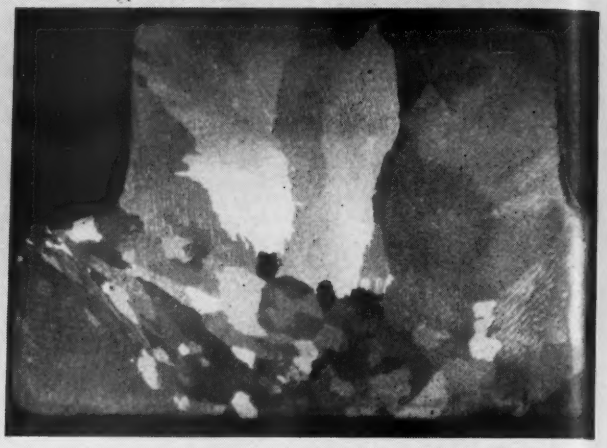

Fig. 2—Grain size also is very large in a shell cast 310 stainless steel. 6X, Chrome Regia etch

How Castings Can Fill . . .

AUTOMOTIVE

This article and the one which follows, on p. 108, take another look at important implications of the automotive gas turbine to foundrymen. Here's a discussion of some of the casting problems involved

WITH THE coming of the automotive gas turbine the automotive industry—an important user of castings—will be related more closely to the aircraft jet and turbo-prop engine industries, which have not been such good customers for foundries. Foundrymen who were not too upset by the trend away from castings in many aircraft applications will have reason to wonder what this automotive change will do to their business. Can a large share of casting business be retained? If so, what will have to be done to hold it?

Many people believe that supplying gas turbine automotive parts will be a snap compared with furnishing jet aircraft parts. Those who have worked with the automotive industry know differently. Not only will automotive requirements be strict, but automotive engineers are familiar with the weaknesses as well as the strong points of castings. They are concerned with quality and price, and will drive a hard bargain. They also are weight conscious and will want lighter alloys wherever possible.

On the other hand, they will be thinking in terms of quantities never dreamed of by the aircraft industry. Furthermore, once a design is established for the coming year's model, there will be little change unless unexpected difficulties are encountered. There are, therefore, some factors which make automotive gas turbine business attractive.

Will Need New Materials—Those familiar with alloys used in aircraft jet and turbo-prop engines may feel that the automotive industry will adopt those materials. That probably will not happen. First of all, cost is an important factor, and no automotive man will pay $2.50 a pound for material when the job can be done with $1-a-pound material by proper design and analysis of stress loads and operating temperatures.

There will not be the tendency to over-design, as often may be the case in aircraft work. Overdesign occurs with the use of high-priced superalloys where cheaper, less strategic alloys will serve equally well. We at Solar Aircraft always have considered it our duty as a subcontractor to call such matters to the attention of the prime contractor when we felt that some economy could be achieved without sacrifice of performance. Often we have recommended a definite substitute material, and in many cases have supplied sample parts made from the material for testing purposes. Possibly this same procedure will be followed even to a greater extent with automotive gas turbine work.

Secondly, although aircraft engine design may be based on overhaul and replacement in 500-1000

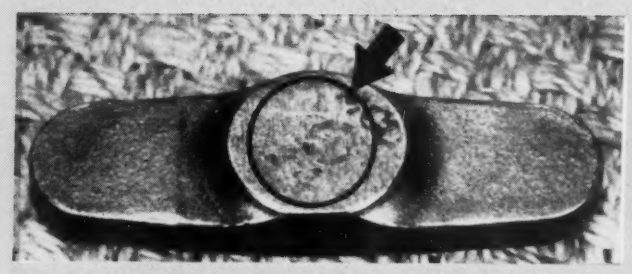

Fig. 3—Austenitic stainless steel was investment cast. Note shrinkage in areas which are encircled

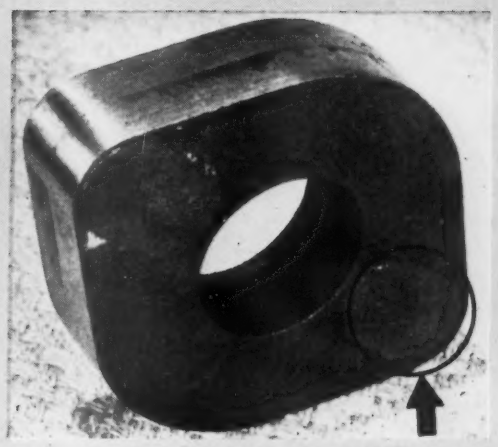

Fig. 4—Encircled areas indicate large gas holes in austenitic stainless steel investment casting

TURBINE NEEDS

By HIRAM BROWN
Company Chief Metallurgist
Solar Aircraft Co.
Des Moines, Iowa

hr, automotive turbines will be considered virtually for "life of the car" performance. That means more hours of use for the engine, and long-time hot properties will be more important than short-time hot properties. The different requirements involved probably will lead to selection or development of new alloys resistant to oxidation and corrosion at high temperature.

What Are the Foundry Problems?—Experience with the evolution of designs and materials for jet and aircraft gas turbine usage indicates that with the high temperature and resultant oxidation involved, superalloys with high percentages of cobalt, nickel or molybdenum may be used in early automotive turbines and until designs are proved. Also, stainless steels probably will be used. Most high-temperature materials are costly and/or difficult to machine. Because of low ductility, many do not lend themselves to forming or welding. Such alloys can be cast to shape, or close enough to it, so that machining is minimized. There will be a demand for close-tolerance castings such as produced by investment and shell molding foundries.

However, both of these casting processes tend to produce very coarse-grained castings of austenitic material — such as 310 stainless (25 Cr-20 Ni)—unless all phases of melting and casting

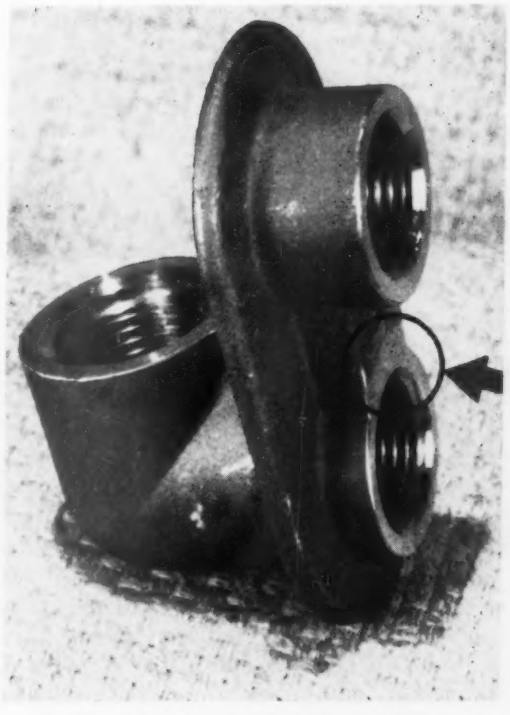

Fig. 5—In austenitic stainless steel casting, shrinkage at edges of cast holes opened up at the encircled areas during tapping and facing

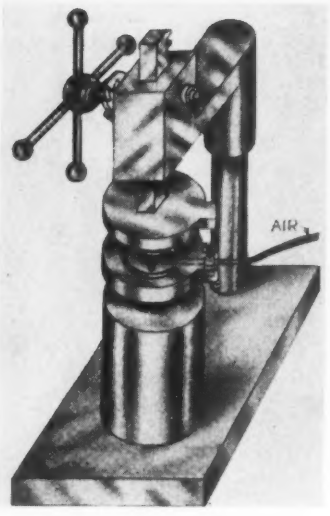

Fig. 6—This simple setup is useful for pressure investment casting of all types of alloys

Fig. 7—Austenitic stainless steel aluminized for resistance to oxidation at high temperature

are controlled. To show how extreme this grain size can be see Figs. 1 and 2, which represent sections cut through investment and shell mold castings, respectively. This coarse grain can cause cracking in the mold, or during a subsequent welding operation. Numerous tests have shown that ductility of many austenitic stainless steels is reduced severely by large grain size in the range of 1100-1700°F. Since that may be within the normal operating temperature range of the parts in question, the coarse grain is undesirable. Some degree of large grain size can be expected in these alloys, but severe superheating aggravates the condition. Too often metal is superheated to increase its fluidity to fill the mold cavity when proper gating is the correct procedure to obtain a filled mold.

Gating and Venting Are Important—The paper of Thomson and McCullough[1] shows what can be accomplished by proper gating and venting. Yet x-rays of supposedly high quality castings often show entrapped gas holes as well as shrinkage or dross inclusions, which occur in many simple castings because the mold was not properly vented.

That x-ray defects are often present in such parts can be shown by Figs. 3 and 4. Fig. 3 is a fairly simple stainless steel casting which has severe shrinkage in the area marked. Fig. 4 represents a simple stainless steel casting which has large gas holes at one end as marked. Numerous castings were made before gating was altered to give sound parts. Fig. 5 is a more complex stainless steel casting with cast-in holes which gave difficulty in casting until gating was altered.

The presence of such defects in many close-tolerance castings leads to 100 per cent x-ray inspection of parts for many jet and aircraft gas turbine applications. The automotive industry is not going to x-ray 100 per cent or pay for 100 per cent x-raying of parts. Foundries doing this work will have to use x-ray inspection as an aid in developing proper gating to establish parts of satisfactory quality.

It is true that proper gating improved all the parts illustrated, but why were they shipped in the first place? It was no secret that high quality was a requirement of the customer. Such things tend to prejudice customers against all castings.

What To Do About It—First of all assume that high quality and reproducibility of parts will be required. Examine the specification and/or purchase order covering the parts. Discuss them with the customer to agree on standards. If slight design changes will help quality and/or cost, try to sell those changes. It may require some selling because many engineers do not understand casting design too well. It is best to work with the engineer from the beginning so that the part is designed—not redesigned—as a casting. Above all do not take an order for a particular part unless you honestly think it can be made properly as a casting.

Wherever possible, visual standards for surface finish and surface defects, and x-ray prints showing acceptable and nonacceptable subsurface defects, should supplement specifications. This relieves the difficulty of reaching agreement on interpretation of written specifications.

Good quality control is needed for two reasons: 1. Rejects at customer's plant must be low enough to minimize inspection required there. 2. Rejects always are costly, but will be more so with the high-grade, high-cost alloys required for some turbine parts. Much money is wasted, too, in return freight. If auto makers receive many bad parts they will not waste time or money on them but probably will send the whole lot back to the foundry with instructions to pick out the bad ones and return the good ones. Proper quality control does not mean merely sorting out the bad castings. Control must start with foundry raw materials, processes and techniques.

Undoubtedly there will be cases when assemblies can be made by welding castings to sheet, bar or tubing, where design permits a good weld joint to

be made. Do not overlook such possibilities of compromise by being hoggish and holding out for all or nothing casting design. Many such combinations can mean a good market for certain castings. Forging people do not turn their backs on such combinations. Why should foundries? Careful study of parts design might indicate to foundrymen many cases where castings could form part of a welded assembly.

Be Sensible About Tolerances — High-quality castings will be required for automotive turbine parts. Foundrymen, however, should determine whether supersmooth surface finish is necessary for proper function of a part or is merely eye appeal to a buyer who will hide the casting from sight in an assembly. Good finish can be obtained by almost any casting method, but the customer must be willing to pay for the extra care involved.

Unduly restrictive surface requirements or unnecessarily tight tolerances can lead to increased scrap, which the foundry will have to charge back into the piece part cost to the customer. For example, a set of data was collected to show the effect of tolerances on rejection rate of certain light metal investment castings.[2] With ±0.003-in. tolerance, rejects were 20 per cent, whereas with only ±0.001-in. tolerance, the reject rate jumped to 90 per cent.

Many of the first parts for automotive turbine engines, because of the alloy, quantity, tolerance, finish, etc., will be cast in shell or investment molds. To minimize risers, centrifugal casting or vacuum casting may be useful. Also, pressure has been used successfully in pouring investment molds from small, rocker type arc furnaces. A simple device can be used for pressure investment casting of all types of alloys. Fig. 6 shows the setup.

Molds are poured on the base of the device. As soon as molten metal reaches the top of the sprue the clamping head is swung into position and lowered against the top of the mold. Air at about 20 psi is applied through the head to the sprue to force metal into the mold cavity. This aids in producing sound castings, cuts down riser metal needed for effective feeding, and increases casting yield. Fig. 8 shows some investment castings made to x-ray quality by the application of air pressure to molds.

Alloys Will Be Downgraded — As the industry progresses, every effort will be made to downgrade alloys to reduce turbine engine cost. At first, possibly alloys high in cobalt and/or molybdenum will be used. The next step would be nickel-base alloys. Then stainless steels of the 18-8 and 25-20 types. Later, possibly 12.5 per cent Cr stainless steel will take their place. High-strength, low-alloy steels also may be used with protective coatings such as aluminum to prevent oxidation. Fig. 7 shows such a part aluminum coated and diffused. Heat resistance is improved greatly.

Where low temperatures, or light loading at moderate temperatures exist, the automotive industry will probably lean toward the use of light metals such as aluminum and magnesium. Auto makers have had years of experience with one-piece cast units of such alloys. Temperature will be the limiting factor, but new developments in both these metals have resulted in good strength up to 600-650° F.

To compete with manufacturers of wrought products, foundries will have to know, or learn, all they can about high-temperature alloys. What do most foundries know about the high-temperature properties of alloys they would like to sell? How do heat shock properties of castings compare with similar alloys in wrought form? How many foundries have high-class laboratories equipped with stress-rupture, creep, and high-temperature tensile testing equipment? What are the welding characteristics of cast alloys? Can foundries hold the close chemical composition which applicable specifications require?

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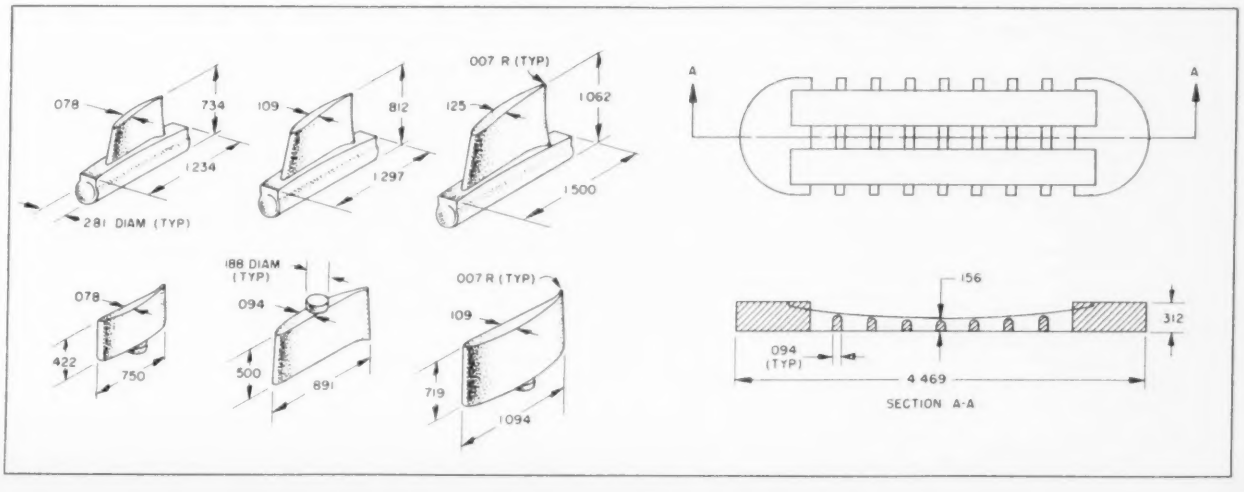
Fig. 8—Illustration shows some investment castings made to x-ray quality by application of air pressure to molds with device of type shown in Fig. 6



New Alloys for AUTOMOTIVE TURBINES

Cost considerations require the development of whole new classes of high-temperature alloys for the automotive gas turbine. In this article, abstracted from a paper presented at the 1956 annual meeting of the Society of Automotive Engineers, the author gives known data on such alloys

By DONALD N. FREY
Associate Director
Scientific Laboratory Engineering Staff
Ford Motor Co., Detroit

TO ESTABLISH the gas turbine as an automotive power plant, whole new classes of high-temperature alloys will have to be developed. The need for new alloys for the automotive gas turbine arises almost exclusively from cost considerations. High-temperature alloys used by aircraft turbine builders would be largely satisfactory for automotive turbines but are too costly.

This article is merely a progress report on new alloys for automotive turbines. Large-scale commercial production of most of these materials has not been accomplished, and operating experience to date on automotive turbines is so limited that material development is largely incomplete.

Table I shows a breakdown of weights for a hypothetical regenerative gas turbine of 300 hp. Also shown in Table I are estimated upper limits of alloy costs for the various categories. The costs are only approximate, but were established with some regard for probable alloy compositions and for production volumes large enough to minimize prices.

The total manufacturing cost of the automotive gas turbine should come close to that of today's passenger-car piston engine. For any conceivable application, it cannot be more than four times such cost. The total alloy cost shown in Table I would fit the upper limit of engine costs and looks just possible for the lower limit. One can readily see, however, how hopeless it would be to meet the low-cost figure with austenitic high-temperature forging and casting alloy costs of $4 per pound, the figure representative of aircraft alloy costs. At $4 per pound, use of the 24 lb in the hypothetical 300-hp turbine would amount alone to about the projected total alloy cost for the engine.

To proceed with the development of needed high-temperature alloys, these limits to alloy use were

TABLE I—Alloy Costs of an Automotive Turbine

Type of Alloy	Usage	Finished Weights (pounds)	Estimated Maximum Cost, per pound	Maximum Cost per Engine
A. Very thin ferritic stainless sheet	Heat exchanger	55	$0.65 (0.002-in. sheet)	$35.75
B. Ferritic stainless sheet	Moderate-temperature, high-stress ducts; high-temperature, low-stress parts	48	0.30 (sheet)	14.40
C. Austenitic stainless sheet	High-temperature, high-stress ducts	45	0.45 (sheet)	20.25
D. Austenitic, high-temperature alloy forgings	Compressor, turbine rotor, etc.	14	0.85 (forging billet)	11.90
E. High-temperature alloy castings	Compressor turbine blading, etc.	10	0.90 (into the mold)	9.00
F. Stainless alloy castings	Power turbine, etc.	30	0.20 (into the mold)	6.00
	Totals	202 pounds		$97.30

established for cobalt, nickel and others:

1. Cobalt not to exceed 5 per cent in the compressor turbine blading alloys. None elsewhere in the engine.

2. Nickel not to exceed 50 per cent in the compressor turbine blading or 5 per cent in other hot, rotating parts. None elsewhere in the engine.

3. Tungsten, vanadium and molybdenum not to exceed 2 per cent in hot, rotating parts. None elsewhere in the engine.

These limitations were established by considering the present and predicted future cost and availability or strategic character of the alloying elements.

Table II shows representative alloying element costs. It is clear that the use of cobalt-base alloys for the 10 lb of austenitic high temperature alloy castings shown in Table I (category E) is prohibitive in cost. The use of 50 per cent nickel in the same application is about the limit to meet the projected alloy cost.

Assuming 50 per cent nickel in the castings in item E of Table I and 5 per cent in items D and F, 7.2 lb of nickel per engine would be used. The free world's production of nickel in 1955 was around 427,000,000 pounds. Volume production in the millions-per-year of gas turbines, each containing a maximum of 7.2 lb of nickel per engine, apparently could be sustained with foreseeable nickel production rates.

Three classes of alloys are being developed to fall within the above listed limitations—iron-base Cr-Mn-N austenitic alloys, iron-aluminum ferritic alloys containing up to 16 per cent Al and cast ferritic alloys with up to 12 per cent Cr and minor amounts of titanium, vanadium, molybdenum and wolfram.

Manganese Austenitic Alloys—Present gas turbine design calls for forging, sheet and casting alloys capable of high stress service within the 1150 to 1400° F temperature range. These alloys correspond to categories C, D, and E of Table I. Ferritic steels are inadequate, generally, for service above 1150° F. Alloys currently employed in this temperature range usually contain a minimum of 8 per cent nickel and as much as 75 per cent.

Manganese immediately suggests itself as an obvious substitute for nickel, although the austenite-forming capacity of manganese is weak compared with that of nickel. Nitrogen, solubility of which in manganese-bearing austenites is higher than in nickel-bearing austenites, is a powerful austenite former. The combination of Mn and N therefore long has been attractive as a substitute for nickel[1]. Recent work[2] also indicates that nitrogen contents of ½ per cent or more allow the addition of several per cent of ferrite-forming hot strengtheners, such as molybdenum, without subsequent austenite decomposition at elevated temperatures.

Room-temperature properties of such alloys are characterized by high yield and tensile strengths with excellent ductility, even after cold-working. The 1350° F creep-rupture properties of Cr-Mn-Mo-N steels are comparable to those of commercial alloys such as the popular 16-25-6, containing 16 per cent chromium, 25 per cent nickel and 6 per cent molybdenum.

TABLE II—Alloying Element Costs

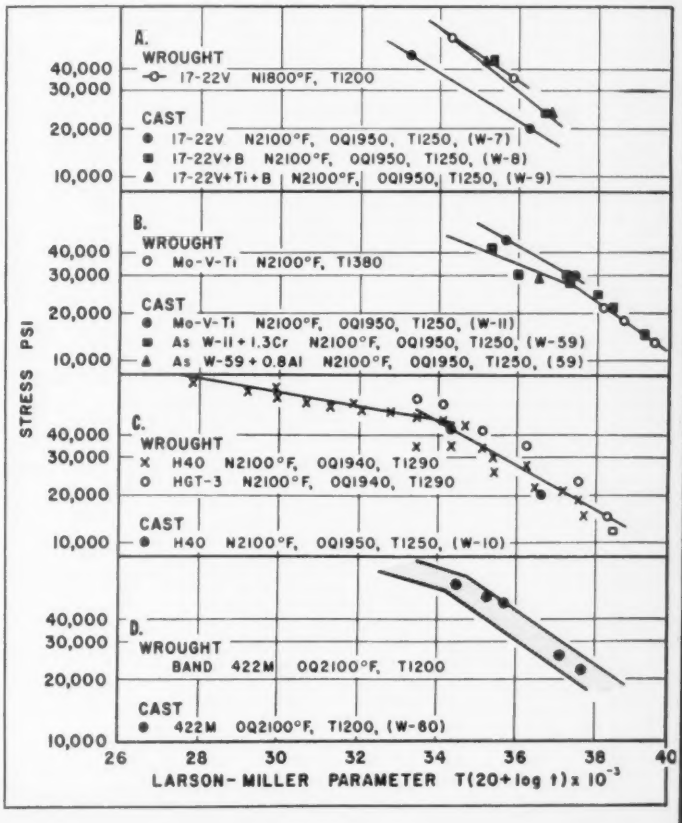
Alloying Element	Cost per Pound Contained
Cobalt (97%-99%)	$2.60-2.67
Nickel, electrolytic	0.645
Molybdenum	1.46
Vanadium	3.10
Tungsten	3.45
Manganese, electrolytic	0.30
Aluminum, pig	0.225
Chromium	0.365

Heliarc (or argonarc) welding tests were made on the Cr-Mn-Mo-N steels, and gas porosity, undoubtedly due to nitrogen evolution, was found. When the welds were made under either a partial or complete atmosphere of nitrogen, sound and ductile welds were obtained. In fact, with the atmosphere modification, the weldability appears excellent.

Chromium - manganese steel containing ½-per cent nitrogen must be made under pressure if ingot gassing is to be avoided[2]. Pressure melting, however, restricts ingot size, and the equipment required is costlier and more complicated than comparable air-melting facilities. An effort was made, therefore, to determine more economical methods of adding nitrogen.

Although tests showed that centrifugal casting

Fig. 1—Chart shows stress-rupture data for representative low-alloy steels given in Table III. For comparison, wrought alloy data are included



appears to lend itself to the manufacture of high-nitrogen austenitic steels, its applicability is limited to relatively small sizes.

A process applicable to the production of large ingots of high-nitrogen steels is suggested by low-carbon rimming steel practice. Gas holes formed during ingot solidification are not detrimental so long as they weld shut during hot rolling. An economic advantage of gassing ingots is the increased ingot-to-slab yield, especially if ingots are mechanically capped. Also, higher nitrogen levels probably can be achieved with mechanically capped ingots than with hot-topped ingots. Commercial-sized heats currently are being produced and evaluated with "rimming" or gassy ingot practice. Results are most encouraging.

To summarize the findings for high-nitrogen manganese austenitic steels, it appears that properties of the rather simple alloys shown are adequate for sheet (category C, Table I) and turbine rotors (category D). Properties are inadequate for compressor turbine blading, however, and further development on stronger, more complex alloys is needed.

Iron-Aluminum Alloys—A definite need exists in the automotive turbine for an alloy possessing very high oxidation and corrosion resistance and only low to moderate high-temperature strength (category B, Table I). It would be used in burner can assemblies and nozzle guide vanes. It must, therefore, be amenable to conventional fabricating techniques such as cold-forming and welding. As usual, economic and strategic considerations rule out the nickel and cobalt-base materials presently employed in many aircraft turbines.

It appears probable, after tests, that ductile and workable simple iron-aluminum alloys with about 10 per cent aluminum can be economically produced, by careful air melting in conventional equipment, in sheet form for very high-temperature, low-stress parts as combustor can liners. It should be appreciated, however, that the use of aluminum-coated plain carbon steel is another possibility. Cost probably will be the deciding factor.

It also appears probable that high-stress parts operating at temperatures up to 1100 to 1150° F also can be made of Fe-Al alloys. Paradoxically, the aluminum content must be at least 10 per cent in order to achieve adequate hot strength.

Cast Ferritic Alloys—In addition to the development of wrought materials for high-temperature use, it is advisable to carry on a cast alloy development program for applications in the moderate temperature range (up to 1150° F). Such alloys would meet the requirements of category F, Table I.

In the last decade, a number of high-creep-strength, low-alloy ferritic wrought steels have been developed for service in the 900 to 1150° F range. A review of the literature for the most promising steels was made, and Table III shows the commercial designations. These same compositions were melted and tested in the cast form along with a few minor composition variations also shown in Table III. The heats were made in a 50-lb induction furnace. Commercial melting materials were used with ingot iron as the base material and the alloy additions made as ferroalloys. Specimens were made from sections cut from 1½-in. keel block. All specimens were heat treated in a protective atmosphere before machining. Testing was performed on 0.250-in.-diam specimens.

The creep and stress-rupture properties of the various compositions were determined, and the stress-rupture data of those representative alloys given in Table III are shown in Fig. 1. For comparative purposes, the stress-rupture data of the wrought alloys are also included. Because of the area of interest, testing was done at 1100 and 1200° F. The heat treatment usually consisted of normalizing at 2100° F, oil quenching from 1950° F and tempering at 1200 to 1290° F. This procedure generally represented the best heat treatment investigated.

In the temperature range investigated, the cast alloys have stress-rupture properties similar to those of the wrought alloys. The one exception is the Cr-Mo-V material (heat W-7), in which cast properties are inferior. Heat treatment may be responsible, as will be demonstrated later.

Of those alloys containing less than 4 to 5 per cent total alloy content, it was found that the Mo-V-Ti compositions (represented by heat W-11) possessed the greatest strength. Since the desired temperature of operation is high, and oxidization therefore is a factor, alloy additions to improve oxidization resistance were made. Chromium was increased to as much as 3 per cent. With 1.25 per cent Cr (heat W-59), a slight decrease in strength was noted. Increased Cr additions further decreased strength. Small aluminum additions, when carefully made, had little effect on strength (heat 59), but further increases of Al brought about a marked decrease in strength.

Boron additions were made to the Cr-Mo-V steels (heat W-7) to increase strength. It was found that

TABLE III—Ferritic Cast Alloy Compositions

Heat Designation	C	Cr	Mo	V	Ti	W	B	Commercial Designation
W-7	0.25	1.25	0.5	0.85	....	....	....	17-22 V
W-8	0.25	1.25	0.5	0.85	....	....	0.02	————
W-9	0.25	1.25	0.5	0.85	0.25	....	0.02	————
W-10	0.25	2.25	0.5	0.85	....	0.65	....	H-40, HGT 3, Hykro V 80
W-11	0.15	....	0.5	0.35	0.25	....	....	Mo-V-Ti (Glen's alloy)
W-59	0.15	1.25	0.8	0.35	0.15	....	....	————
59	0.15	1.25	0.8	0.35	0.15	(Al 0.8)	....	————
W-60	0.28	12.0	2.5	0.5	....	1.5	....	422 M

TABLE IV—Effect of Solution Temperature on Stress-Rupture Properties of Cast 422-M (Heat W-60)

Test Condition	Solidification Temperature	Stress Rupture (hours)	Elongation (per cent)	Reduction of area (per cent)
1100° F. and 47,500 psi	2200	500	...	...
	2100	488	28	62
	2000	...	...	...
	1900	234	32	56
1200° F. and 22,500 psi	2200	251	9	15
	2100	431	33	41
	2000	255	32	55
	1900	171	50	84

All samples drawn four hours 1200-1275° F

B alone gave improved strength and that further addition of titanium, as indicated in the literature, is not necessary. The strengthening effect probably was associated with a transformation product having an increased resistance to tempering or to the dispersion hardening of a precipitated boride such as molybdenum boride.

In the 12 per cent Cr group of alloys, the most promising was modified 422. The cast properties, with those of the wrought material, are given in Fig. 1, D. Again, it will be noted that the cast and wrought materials have similar stress-rupture properties over the temperature range investigated.

Strengthening with boron and B plus Ti was tried with this composition also. Additions of 0.01 and 0.04 per cent B to this alloy gave decreased stress-rupture properties as the amount of boron increased. Titanium additions had little effect.

Throughout the testing program, tempering was carried out at 1250° F. This temperature is in the general range for development of optimum strength by tempering and is sufficiently above the proposed maximum operating temperatures to insure a reasonably stable structure. Normalizing and solution temperatures were varied and were found to have a large effect on the stress-rupture properties. This effect is shown in Fig. 2 for the materials containing a maximum of 4 to 5 per cent total alloy. All normalizing and solution treatments were followed by a temper of six hours at 1250° F, and the tests were run at 42,000 psi and 1100° F. Generally, the best treatment for these alloys was to normalize at 2100° F and to follow with a solution treatment at 1950° F. With the high-temperature normalizing treatment, a more homogeneous alloy was obtained, and further treatment gave a better distribution of the carbide. High-temperature solution treatments gave a more acicular ferrite, a structure which often is associated with improved creep resistance. The high solution and normalizing temperatures are particularly important in the titanium and/or boron bearing alloys. Similar results were obtained in tests run at 1200° F and 20,000 psi.

An increase in solution temperature results in improved stress-rupture properties of the 12 per cent cast Cr alloy investigated. Table IV presents these data and shows that 2100° F is about optimum. No measurable difference was noted in properties as a result of tempering at either 1200 or 1275° F.

In conclusion, cast and heat treated Mo-V-Ti appears to have excellent strength properties up to 1100° F, but would have marginal oxidation resistance in many turbine applications. The less economical 422 M has about the same strengths at 1100° F, but better oxidation resistance. The blades of a power turbine perhaps could be made of 422 M and the hub of Mo-V-Ti. The prime disadvantage of both of these alloys appears to be the rather difficult and expensive heat treatments required to obtain good high-temperature properties.

Conclusions—A start has been made in developing the new alloys needed for the automotive turbine. It appears that the stringent limitations on cast or strategic alloy content can be met at least in part with the types of alloys described. Extension of this work should lead to meeting all the high-temperature alloy requirements for the mass-produced automotive turbine of the future.

Acknowledgements—The developments outlined have been carried out by almost the entire staff of the Metallurgy Department of the Scientific Laboratory of Ford Motor Co. In particular, the writer wishes to acknowledge the contributions of Drs. E. Morgan, V. Zackay and W. Kiessel.

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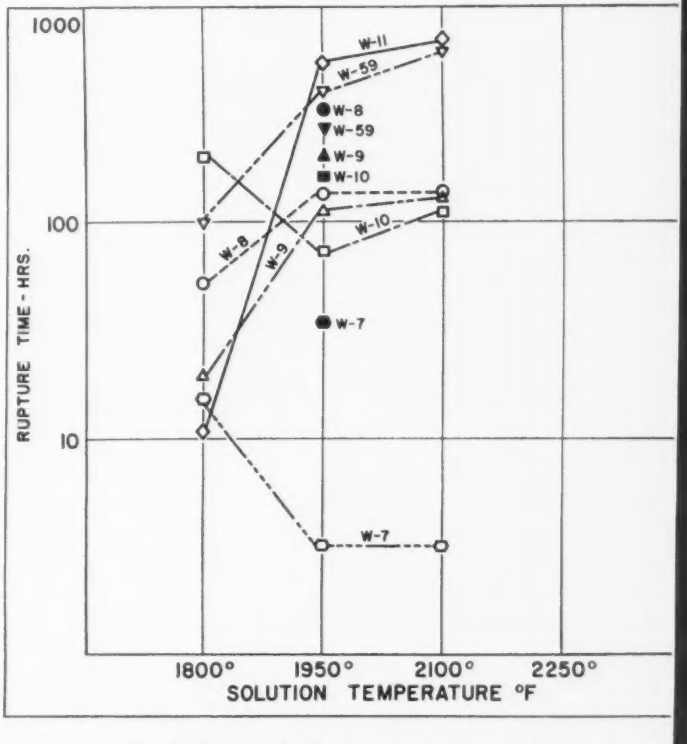


Fig. 2—Chart shows effect of varying normalizing and solution temperatures on stress-rupture properties of materials with 4 to 5% total alloy

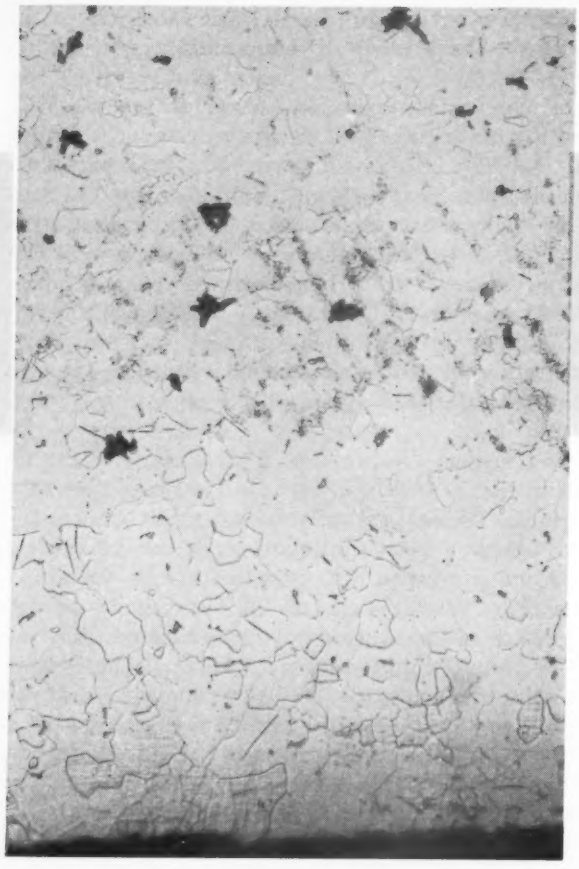


Fig. 1—Microstructure (100X, 2% Nital etch) of similar castings heat treated in reducing atmosphere (above) and in a dry, neutral atmosphere

Processing of

By LYLE R. JENKINS
Wagner Malleable Iron Co.
Decatur, Ill.

PEARLITIC malleable of the type to be described is a malleable base iron which, when heat treated, contains a controlled amount and form of combined carbon. It is strong, tough, wear resistant, hardenable, machinable and castable.

This article describes a method for producing uniform and consistently high quality pearlitic malleable castings. It expresses the interest, attitude, experience and aim of a producer to make a product of which he is proud. It is not intended to criticize methods used by other producers in the industry. The general physical properties are described thoroughly in the literature, and the published values are so variable and controversial that they will not be presented in this paper.

Pearlitic malleable castings are considered as machine parts and, as such, the material used in the production of these parts must be of uniformly high quality.

The two primary requisites for producing high-quality pearlitic malleable are technical talent and proper equipment. Technical talent is necessary to understand, appreciate and solve production problems as they arise and to improve continuously the process and quality of the product. Properly designed and operated equipment is necessary to maintain a uniform quality, production rate and metallurgical control of the material.

The process control of pearlitic malleable starts with the molten metal and continues through the heat-treated product. It requires narrow ranges so far as chemical analysis variation is concerned and good control of metal conditions such as oxidation and gas content.

The necessary controls in melting, casting, and heat treating required for the material will be discussed in detail.

Melting Control—This control starts with the

Pearlitic Malleable Iron

This article describes one method for producing uniform pearlitic malleable castings of consistently high quality. It was presented at the Wisconsin Regional Foundry Conference, in Milwaukee, last Feb. 9-10

raw materials which are charged into the cupola. Uniform melting rate and cupola iron quality are maintained by selecting clean, uniformly-sized steel scrap. By keeping the melting stock in the shaft of the cupola at a uniform permeability, it is easier to maintain a level operating coke bed and constant silicon recovery. Coke of a proper size, density and distribution is equally important in this respect, in addition to maintaining a uniform carbon content of the cupola iron. Cupola dimensions and operating practice are also controlled to provide uniformity of molten metal.

The cupola feeds a continuous supply of molten metal to the air furnace, which serves as a blender, superheater and a refining unit.

Carbon Control—The air furnace reservoir should be large enough to allow the iron to be in the furnace for sufficient time to refine the metal by reducing the carbon and CO content and increasing the temperature to a level at which the iron can be transferred and poured into molds. This provides a metal with good fluidity for casting and an inhibition to mottling during solidification. Metal from the cupola contains enough excess carbon to enable the air furnace to be fired with a high CO_2-content flame. A high CO content of the metal may cause mottling in the center of heavy sections or in a rim at the surface, especially where a carbonaceous material is present in the mold cavity. The metal may contain an excessive amount of CO if the carbon content of the cupola iron is low and a reducing flame is used, or if carbon is added to the air furnace.

The range of carbon variation in the metal from the air furnace should be narrow to provide uniformity in response to heat treatment and to maintain good properties.

Silicon Control—Variations in silicon content of pearlitic malleable have a strong effect on the metal in its response to tempering after air quenching from above the critical. In a given lot of castings subjected to the same time-temperature tempering cycle, those which analyze 1.25 per cent silicon may temper to approximately 235-241 bhn while others which contain 1.35 per cent silicon may temper to about 197-207 bhn. The difference may be even greater if the material is tempered to a lower hardness range or if the silicon shows a wider range of variation.

Chromium Control — Excessive amounts of chromium inhibit the completion of the primary phase of pearlitic heat treatment which is the complete removal of as-cast combined carbon. Variation in the normal amount, such as increasing from 0.03 to 0.05 per cent, will affect the response to tempering as do castings which have a low silicon content.

Boron Control—A controlled boron addition is made to each ladle. It accelerates the removal of as-cast combined carbon which improves heat treatment and consequent machinability of both malleable and pearlitic. If the boron content of the metal gets above 0.003 per cent, difficulties may be encountered in the tempering cycle. A half-inch square section could have a combined carbon content sufficient to produce a bhn of 207 at the surface with a core which is free of combined carbon and shows a bhn of 137. Mottling tendency should also be considered a possibility. In still greater amounts, above 0.10 per cent, there is a possibility of forming stable, extremely hard boron carbides. This would affect machinability adversely.

Manganese Control—Manganese contents above that necessary to combine with and precipitate sulphur tend to increase the resistance of pearlitic to tempering. Current tests indicate that excessive

Fig. 2—Uniform cooling rate produces microstructure of fine pearlitic (750X, Nital etch)

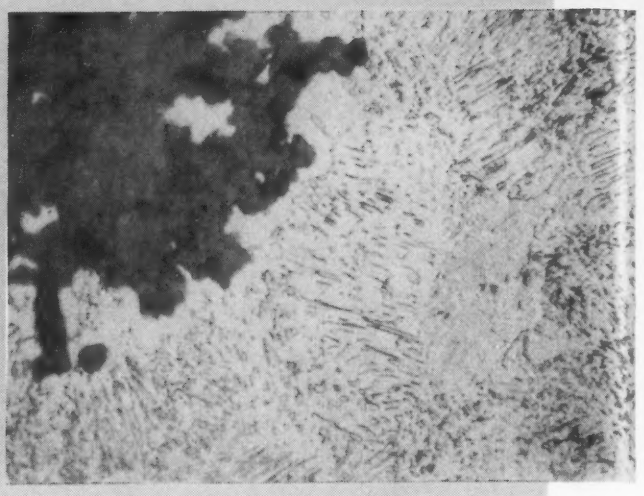


Fig. 3—Microstructure of air-quenched part after it has been tempered (750X, Nital etch)

manganese content in metal reduces ductility.

Phosphorus Control—Phosphorus tends to increase the tensile strength at the expense of ductility. It raises the nil ductility transformation temperature. This condition was determined recently by the Naval Research Laboratory, in Washington, from a test it developed to ascertain the temperature at which a metal transforms from a ductile to a brittle material.

It was found that for each 0.01 per cent phosphorus increase, the NDT temperature increased about 10°F.

The scope of this paper is not wide enough to cover all the known, let alone the unknown, factors which affect the quality and uniformity of the molten metal used in the production of pearlitic malleable.

Heat Treatment—The primary phase in the heat treatment of pearlitic malleable consists of subjecting the castings to a sufficient time-temperature cycle to completely remove all traces of as-cast carbides and then fast cooling the material to produce a microstructure of graphite nodules in a matrix of fine pearlite.

This is accomplished in a continuous type, radiant-tube fired furnace. The furnace is divided into zones of constant uniform temperature. With a uniform travel schedule, therefore, all castings are given the same amount of time at each temperature in the furnace. The unit loads going into the furnace are restricted to 500 lb, small enough to minimize any heat lag throughout the cycle and to allow a more uniform cooling of the load in the quench. Proper control of the temperature drop will minimize the tendency to form ferrite rings around the graphite nodules.

The furnace is sealed carefully to prevent combustion products of the burners from contaminating the controlled atmosphere inside. The furnace is purged continuously with a dry neutral gas. A positive pressure is maintained inside the furnace to prevent possible inward seepage of air.

The neutral gas consists of 99 per cent nitrogen, 0.5 per cent carbon monoxide, and 0.3 per cent hydrogen with a dew point of −30 to −40 F.

A dry neutral gas is being used because the carbon potential of malleable or pearlitic is high and it is nearly impossible to produce a reducing atmosphere which would not extract some carbon from the metal. With a reducing atmosphere it is possible to produce a surface free from total decarburization with a high CO/CO_2 ratio; there will be a partial depletion of graphite nodules at the surface, however, which has a deleterious effect on machinability. The nodule-free ferrite wipes onto the cutting edge of the machine tool, creating high heat and burning. This condition may spall carbide cutters or soften tool steels to an extent that a reground edge will not hold up. This nodule-free rim also produces a surface of higher combined carbon content which may tend to crack in heat treating, such as in the flame or induction hardening of rocker arms. If the surface has a higher combined carbon content than the core it will not temper to the same hardness during the heat treating cycle.

Fig. 1 shows a comparison of the microstructures of two similar castings. "A" was heat treated in a furnace using a reducing atmosphere (9 per cent CO, 4 per cent CO_2). "B" was heat treated in a furnace using a dry neutral atmosphere. Malleable iron was used for this example because the graphite nodules show a better contrast against ferrite than pearlite. The results, however, are the same in pearlitic malleable.

The castings are discharged from the furnace at 1650°F and spread out into a high - volume air stream to provide a uniform cooling rate sufficient to produce a microstructure of fine pearlite, as shown in Fig. 2. It is important that this be done

as fast as possible to eliminate the pronounced bulls-eye formation around the graphite nodules. The air-quenched parts are then tempered in a recirculating type batch or continuous furnace.

The tempered microstructure is shown in Fig. 3. Notice that spheroidization of the pearlite is not complete and the density and degree of spheroidization depends on the fineness of the as-quenched pearlite. This in turn is dependent on the ability to extract the heat uniformly and fast enough for the austenite to transform at a low enough temperature to form fine pearlite. Heavy sections will not cool fast enough in air and will thus transform at a higher temperature, producing a coarser pearlite which will not spheroidize as readily in tempering and consequently will affect the machinability.

The tempering of air-quenched pearlitic is a function of time and temperature. Slight variations in temperature have a pronounced effect on the resulting hardness. Variations in time at temperature are also significant to the hardness control. For this reason control instruments must be accurate, and recirculation in the furnace must be such as to minimize any heat lag present in the load.

If a customer requires a stronger but machinable material having a high ratio of yield strength to ultimate strength, or if he wants greater machinability than an air quenched and tempered structure of the same hardness, the castings are hardened after removal from the air quench. They are heated to above the critical and oil quenched to a martensitic microstructure as shown in Fig. 4. The castings are then tempered to a specified brinell hardness range. The tempered microstructure is shown in Fig. 5.

The hardening furnace is a continuous belt type with a 3 x 21-ft hearth area. Castings are loaded on the belt in such a way that they are dropped as singly as possible through a snorkle tube lined with oil jets and into a large quench tank. This tank contains approximately 7300 gallons of oil. A motor-driven propeller agitates the oil violently across the bottom of the tank toward the snorkle tube. This arrangement assures a uniform quench. A carefully selected grade of deep-hardening oil is used which inhibits cracking and remains stable.

The castings move up and out of the quench tank on a continuous apron conveyor, which empties them onto an oscillator conveyor leading to a continuous tempering furnace.

The tempering furnace is a continuous belt type furnace with a 6 x 41-ft hearth area. It has two control zones, each one containing a burner block and a high-velocity recirculating fan which insures rapid and uniform heating of all parts in the furnace.

Summary—Processing of pearlitic malleable requires much closer control throughout the entire operation than does standard malleable.

To insure uniformity by minimizing heat lags and equalizing cooling rates, the unit loads of castings in process are kept as small as practicable.

It is important that castings day after day be of the same high quality and uniformity. This enables a customer to set up a production machine line and feel that without checking every casting for hardness, all shipments of the product to his plant will meet specifications and he can keep his tooling changes at a minimum.

Pearlitic processes should be under careful supervision at all times. The best tools for supervision are proper metallurgical knowledge of the process, accurate and dependable instrumentation, and proper design and functioning of the equipment. All of these tools are available today and do away with the need for ladle gazers and tempering by color interpreters. A metallurgical department must be sufficiently well staffed and equipped to keep constant surveillance over the melting and heat treating processes 24 hours per day.

Fig. 4—Martensitic microstructure in casting was produced by heating it to above critical, then oil quenching it (750X, 2% Nital etch)

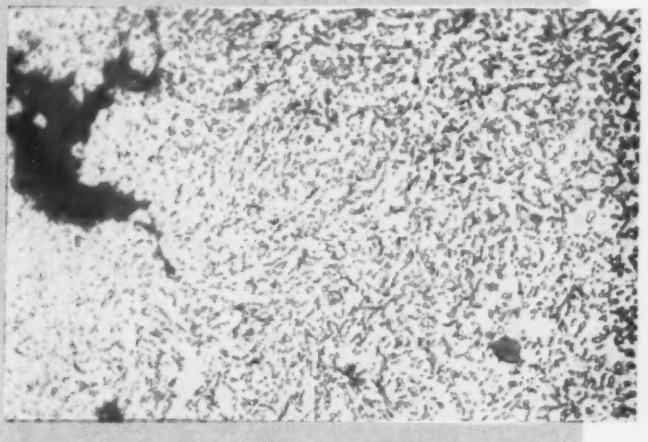
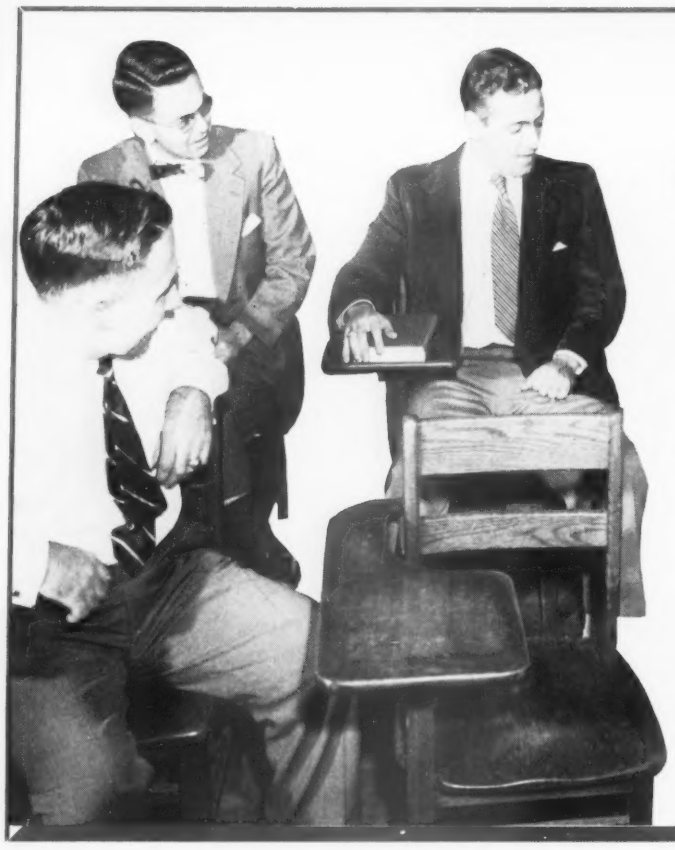


Fig. 5—Microstructure of casting heated above critical, oil quenched and tempered to a specified brinell hardness (750X, 2% Nital etch)



The Economics of FOUNDRY

By CHESTER V. NASS
Vice President and General Manager
Beardsley & Piper Division
Pettibone Mulliken Corp.
Chicago

THERE's a rare and precious material being mined in every state in our country today. The material is scarce and the market is tremendous because few industrial concerns can survive without it. It's a rental market, however, for this material can't be purchased. Its rental cost at the mine—in an unrefined state—is approximately $5000 per unit per year, and some 5300 of the nation's industries are entering formal bids for this material, competitively and earnestly. In a very real sense, they are bidding not only for their growth, but for their very survival.

This precious material is, of course, the young college graduate and, more especially, the engineering graduate. The mines I refer to, and not in any depreciatory sense, are the colleges and universities of our nation. This year, some 1800 of these institutions will graduate approximately 300,000 students. Fewer than 35,000 of these graduates will be engineers and fewer than 30,000 will be available to industry. The balance will continue on to higher education.

As these engineering students near graduation, the work of some 20,000 professors and associates, who have trained these people, will near completion, in so far as this year's group is concerned. The work of American industry, in first attracting and then utilizing these graduates, will just begin. It is in this work that the foundry industry, and especially the major segment of our industry—the small and medium size foundries—has lagged badly behind other industries.

A Difference in Appeal—Industries and industrial concerns vary considerably in the appeal that they engender in the young graduates. This is best illustrated by placement statistics. An executive in the instrumentation field recently estimated that only one out of every two graduates offered positions in that industry accepted. In the machine tool field, a similar estimate places the ratio at one out of three.

On the other hand, it is reported that of the 6000 graduating students interviewed by General Motors Corp. at 125 campuses, 2000 were offered jobs and 1700 accepted. This high percentage of acceptance can undoubtedly be attributed to the efficiency of the company's recruiting program, but it can be assumed that such "glamorous" fields as atomics and aeronautics would also have a relatively high drawing power.

Unfortunately, the foundry industry has always been notoriously poorly publicized. The glamour—the excitement—of the industry, though extremely real to those within the field, is—at best—obscure to nonfoundrymen and even to top management of some organizations operating captive foundries. The industry has little apparent impelling or magnetic force to attract young engineers. In my own case, it wasn't the "romance" of the foundry that attracted me to a life within the industry—a life that has been basically rewarding and satisfying. Having graduated as a chemical and metallurgical engineer I was attracted by the opportunity to work on two interesting research problems.

You will recall that in the early twenties mal-

ENGINEERING

Mr. Nass points out the foundry industry's great need for young engineering talent. He presented this paper at the 1956 annual College-Industry Conference of the Foundry Educational Foundation

leable iron heat-treatment cycles were long, and malleable iron was subject to embrittlement at galvanizing temperatures. The development of a process to overcome this was one problem.

It hardly seems possible now that, at that time, we were just learning how to test foundry sands. The results of such simple tests as green strength and permeability, made on carefully prepared samples and tested in the Cornell University Laboratory and the laboratories of seven or eight cooperating companies, sometimes showed little similarity. This surely presented another interesting problem.

At that time, at the beginning of my career, my interest was in the problems at hand, not in the industry as such. The glamour—the magnetism of the foundry industry—did not register until normal developments in the research problems required close contact with plant processing and control. Only then did the foundry exert on me—as it invariably does on all of us—its almost magic retaining force. So, we must not let this force, which so strongly grasps all of us in the industry, blind us to the problems facing us in attracting young engineering talent.

A Unique Problem—The foundry industry's problem in attracting this talent is a unique one, for the foundry industry is unique. First of all it is a basic industry with an output of over six billion dollars annually; yet the average unit-plant size, in number of employees, is only 69.

The industry spends over a million dollars an hour for materials and supplies, yet—until in comparatively recent years—there was little or no interchange of information regarding equipment or processing conducive to the most intelligent spending of that very respectable amount of money.

Unlike many other essential industries which are based wholly or largely on science, our foundry industry, one of the oldest, is based on art—art drawn from the great civilizations of the past. Only in recent decades has science been at work within the foundry industry. Certainly those industries based on, and emanating from, science will have greater romantic appeal for youth in this highly technical age. Then too, these other industries have had the acceleration provided by heavy government subsidy. The foundry industry has never been subsidized.

These new industries born of science and nurtured by the demands of wars have shown tremendous growth—and they have a dramatic appeal to young engineers. Since that day in December, 1952, when Dr. Enrico Fermi consummated the world's first controlled nuclear reaction in a University of Chicago squash court, the atomics industry has mushroomed in scope and size. Today few older industries remain unaffected by this still infant one.

In a like manner, the automotive, the aeronautical, the electronic, and many other industries have grown in size and appeal in spans of years so short that they are but as moments in the antiquity of the metal castings field. Against this background of competition for young engineering

A rare and precious material is being mined in every state in our country today. This material consists of the young engineering graduate

talent, where does the foundry industry stand today?

Ways of Looking at It—Let us consider this problem from four standpoints.

First—Does the foundry industry really need engineers?

Second—Does the young engineering graduate represent a sound economic investment for the foundry, especially for the smaller or medium size plant?

Third—Does the foundry represent a sound economic investment for the engineer?

Finally—What can be done, especially by the smaller plant, to attract engineering talent?

The need of the foundry industry for young engineering talent is a very real and immediate one. Actually, the filling of this need is essential for survival. For hundreds and even thousands of years, founding was an art. In ancient days the so-called secrets of the art of metal casting were jealously guarded family treasures and, in more recent times, were equally well guarded company secrets. The mysticism and secretiveness that surrounded foundry procedures were not conducive to research or development, so these activities were hampered. As a result, other processes captured a considerable portion of the castings market.

Introduction of the power forging press in the United States in the 1880's, and the developments that followed, represented the first real challenge to metal castings. The development of the first triple-acting hydraulic press capable of making stampings from strip or bar stock, in the early 1890's, sounded another challenge. The first patent on resistance welding in 1888 and subsequent developments in that field offered still further challenge.

The foundry industry failed to meet these challenges. No new developments were forthcoming within the industry to counteract the rapid developments in competing fields. In each case a segment of the foundry's business was lost. As these other processes became more fully developed, the loss of market became more severe. In the foundry industry, labor costs continued to rise and we were guilty not only of letting our costs get out of line, but of not knowing our costs. Further, we gradually lost our artisans and did not develop new skill to replace the loss, much less provide for the normal requirements of industry expansion.

Only in the last few decades have we thrown off the yokes of secrecy, apathy and lethargy, and started to progress in an energetic, resourceful and aggressive manner. Actually, one of the really important reasons for our new-found progressiveness has been the gradual infiltration of engineering ability into the industry. This engineering talent has provided the foundry new approaches to the old problems and brought to it the ability to analyze the problems from more than one point of view. It was instrumental in correctly analyzing the problem and pointing the way to its solution. It changed the concept of metal casting from a narrow, sometimes blind, approach to a broad scientific one. The industry, basically a rugged and resourceful one, has responded to this new leadership and to the scientific approach in an energetic manner.

But being alert to our problem and aware of the path toward solution is only half the battle. Each day brings new demands for an improved product and with it the necessity for improved product control. Competitive processes have not been, and are not now, standing still. Authoritative sources, for example, predict that stamping press speeds—already as high as 600 pieces per minute for some applications—will reach 1000 pieces per minute ten years hence. The challenge of competition can only be met through more scientific operation, through a reduction of costs to more competitive levels and, most important, through the development of new and better processes and equipment.

As a case in point, we might consider the growth of the aluminum industry. It is not difficult to understand why that industry's prospects were poor, back in 1860, when commercially produced aluminum ingot sold for $18 a pound. New processes and scientific operation have reduced that cost to approximately 26 cents a pound today, and the future of that industry is as bright as its product. We might well contemplate the position of that industry if it had plodded along without the catalytic action of engineering and technical talent.

The Need Is There—Obviously, if the foundry industry is to compete with other industries successfully engineering talent will be required in ever increasing quantities. We must have engineers for research and development in materials, in processes and in equipment. Engineering talent in our purchasing departments is an advantage in translating this research into intelligent purchasing. The same talent is essential in our production department if our process control is to keep pace with our process development. So on along the line—in process engineering, in product engineer-

ing, in supervision, in sales and in the development into top management.

Thus, the need is there, and with each new development in the foundry industry, the need will become greater. The first introduction of shell molding is an example. In terms of engineering talent, the development of the process was only the beginning. Since that development, millions of engineering hours have been required to adapt the process to production, to develop practical equipment for the process, to develop successful sand practice, pouring procedures and cleaning methods, to work out production and quality control procedures, and finally to acquaint casting purchasers with the proper application of shell-molded castings.

Certainly, if we are to keep pace, we must depend primarily on engineering skill. A major portion of this talent must be new talent attracted from the college campuses. These young engineers represent our opportunity for advancement.

Alternate Choice Expensive—In deciding whether young engineers represent a sound economic investment for the foundry industry, we may well study the impracticability of our alternate course. Can we afford not to attract and utilize young engineers? It would cost far more to stay out of the engineering talent market than to enter it. This cost would be measured in terms of lost markets, as competitive processes move into existing, as well as new, metal casting fields, or as castings price themselves out of some markets because of our failure to control costs.

To keep pace, the foundry industry must secure engineering talent from the college campuses

This reasoning applies to small as well as large foundries. Many large plants have utilized young engineers for many years and many have developed comprehensive training programs. The young engineer is often utilized as a departmental foreman, while he is on his way up. But realistically, we must consider the problems of the smaller plants, too, for of the 6208 foundries in the United States and Canada, 84.2 per cent employ fewer than 100 employees in their organizations.

Few of these small plants can afford a program of having a number of young engineers on a continuous "in-training" status. Yet, if they are to compete successfully with larger plants, it is essential that they too, devote effort to developing fresh engineering talent. For these plants the answer may well be a limited program with a personal touch, where one or two young engineers are guided carefully through training stages as they work in various foundry jobs. It is essential in such an arrangement that the person in charge of these young engineers be well qualified and able to sustain their interest until the industry exerts its own magnetic influence on them.

In terms of economic soundness, the advantages of investing in young engineers may be roughly summarized as follows for the smaller foundry:

1. The young engineer brings a background of engineering information and knowledge. Though this is naturally limited, at least he possesses the knowledge of where and how to obtain further sound information as occasion arises.

2. He has a broad general background of engineering skills—in chemistry, metallurgy, engineering calculation, engineering analysis and others which, with proper guidance, may prove of immediate value to the small foundry.

3. He has a great capacity for learning and is able to understand quickly the significance of the various phases of foundry operation, thus being able in a minimum of time to offer suggestions for improvement in methods.

4. Even in the small shop, he may well be of immediate value as a technician or process control man, although it must be recognized that the first several months of employment are basically a period of orientation and assimilation without full productive benefit to the foundry.

5. He represents potential leadership for the foundry—leadership in research, production, engineering and sales.

6. Most important, the need of developing management is of as great, if not greater, importance to the small foundry as to the large organization. We must develop, not only for replacement, but to meet the additional requirements in the knowledge and understanding needed in every management position today. Management problems are becoming more and more complex.

The need for managerial ability is increasing faster than business growth because of technical and scientific developments and the inherent complexity of business and government relationships. The small foundry requires broadness and scope in each management position. The young engineer represents this potential management ability.

Even if it is fully established that the young engineer is a sound investment for the foundry, that is only half the picture. To fully understand the problem we must see how the foundry industry will look to the young engineer about to enter industry. In other words, does the foundry represent a sound investment for the young engineer?

Fabricast Division, General Motors Corp.

The foundry industry offers a continual challenge to engineers. Its low ratio of college-trained to noncollege-trained men provides a great opportunity

In a very real sense he is making an actual investment of the years and money spent for an education in his first, very important, venture in industry.

What Foundries Have to Offer—Let us examine the advantages that the foundry—even the smaller foundry—offers the young graduate.

1. The revitalized foundry industry is expanding—in size, scope and process.

2. The industry has a relatively low ratio of college-trained to noncollege-trained men, providing great opportunity for trained men. In recent years college-trained men have advanced rapidly in our industry.

3. There is ample opportunity for all types of skills in the foundry executive field—research, management, financial, etc. All types of engineers are needed.

4. The foundry industry is a basic industry, mature in stature, offering stability of opportunity and employment.

5. Even with this maturity, the industry has youth and vigor—new processes, new equipment and new concepts are constantly entering the picture.

6. The foundry industry is now extremely alert to its need for college-trained men. Such "new blood" is courted and well received, no longer scorned by the practical foundryman, apprehensive of his security and jealous of his limited knowledge. I well remember the daily morning greeting of one old-timer during the first months of my foundry career. Uncomplimentary at best, his daily taunt reflected to some extent the resentment of an entire industry, at that time, to technically-trained men.

7. The industry offers a continual challenge to engineers. Even well established processes are constantly undergoing change. While some segments of our industry are at the threshold of mechanization, other segments have gone on to automation.

8. The rate of compensation and the rate of advancement are well above average. Many top executives of nationally known firms started in the foundry division of their companies.

9. Progressive foundry organizations are not concentrated in particular areas (as for example are plants in the aircraft industry), but are located throughout the country. The foundry industry will continue to be made up predominantly of small units serving every area of the country and practically every segment of our economy.

10. The foundry industry is alert to its faults and is constantly taking steps to improve working conditions.

11. New, highly scientific fields such as atomics and aeronautics are partially dependent for further progress on developments in the metallurgical and metal castings fields. As an example, new high-temperature alloy castings are essential if aircraft speeds are to be advanced further. Engineers with a sound understanding of metal castings will be essential to serve the atomic, aeronautic and other industries.

Some of the Shortcomings—There are points in our favor in attracting new engineering talent. But the young graduate will look at the other side of the ledger, too. In all fairness, we must recognize some of our shortcomings from the young engineer's point of view.

1. As a rule, foundries have not yet reached standards of safety and housekeeping set in other metalworking industries, although some foundries have set standards that equal or surpass those of other fields.

2. If the young engineer seeks employment in a "glamorous" industry he might find that the public does not yet recognize the "glamor" of the foundry.

3. There are relatively few sales positions for engineers in the foundry, although there are many in related fields.

4. There are few soft spots. The industry's opportunities are available only to those who will work for them.

5. Only a few foundry organizations have a planned program of advancement for engineers.

6. In general, advancement is not scheduled, it is merited.

7. Comparatively few foundry organizations yet offer planned bonuses or retirement benefits.

8. Few foundry organizations offer opportunities for continued formal education as do some organizations in other industries.

9. In general, only the larger foundry organizations are able to absorb the young engineer whose abilities and aptitudes are exclusively in the research field.

10. Only a few large foundry organizations are able to offer the young engineer an "engineering atmosphere" in which to work—that is a chance to work and consult with a group of other engineers.

A few of these points would seem to give the large foundry an advantage over the smaller one in attracting young engineering talent. This should certainly not discourage the smaller plant, for there is one very important point in their favor. Many young graduates have an outright preference for the smaller company. They prefer the advantages of closer personal contact with, and more personal recognition from, top management.

Most important from the standpoint of foundry management is our course of action. What can the foundry industry do to attract more young engineers?

The Foundry Educational Foundation represents a most forward, worthwhile step. After eight years, we are now in a position to appreciate the great foresight of the men who conceived and established this foundation. Though still in its infancy, its contribution has already been sizeable, with well over 1200 foundation-trained graduates placed in foundries or allied firms. It represents our best efforts to date in the engineering talent market, and we industry people must continue to support the foundation in every possible way. Contributions of time, equipment and funds will continue to be essential.

Public Impression Important—Just as important, however, is that steps be taken to improve the impression that the public holds of the foundry industry. Efforts to do a better publicity job should be stepped up. Too few of our larger firms have made exemplary films and publicity material available to schools and the public. Not enough newsworthy information on foundry improvement has been released to newspapers and other molders of public opinion. And here is where the smaller plant, too, can make a real contribution. High school and trade school classes can be invited to see our plants and to learn how castings are made in a modern foundry. These youngsters will be impressed when they are told of the essential part played by castings in the most modern fields.

Most important, we must never cease our efforts to make the foundry a better place to work. Tremendous strides have been and are being made. With this analysis, the answers to our earlier questions become clear.

To the question "Does the foundry industry really need engineers?" the answer must be an emphatic "yes."

The same answer applies to the second question—"Does the young engineering graduate represent a sound economic investment for the foundry?"

The third question—"Does the foundry represent a sound investment for the engineer?"—must also be answered affirmatively.

As to the fourth question—"What can be done to attract engineering talent?"—certainly with concerted effort we can attract the men necessary to our future, for our industry offers a real challenge to the young engineer. The very shortcomings previously mentioned are a challenge, a challenge that will not go unaccepted.

All indications point to a gross national product of $600 billion by 1975. If the foundry industry keeps pace with our expanding economy, our industry's share of that market will be $10 billion. With a broader base of engineering skill and talent even that goal may be easily exceeded.

Engineers are needed in production departments to help process control keep up with development

By HARRY ST. JOHN
Foundry Consultant

Detrimental Impurities in Brass Foundry Alloys

The eleventh of Mr. St. John's articles on The Brass Foundry considers the occurrence and treatment of impurities in alloys

ALL COMMERCIAL castings contain appreciable amounts of impurities, commonly limited to a total of not more than 0.50 per cent, and all tolerate such impurities within certain prescribed limits. Some impurities are so poisonous to certain alloys that scarcely a trace can be tolerated. Others, more neutral in their effect, may be present up to 0.25 per cent without noticeable damage. In still other cases, an element may be added to an alloy up to 1 or 2 per cent because, within this range, it is beneficial but in larger amounts becomes an injurious impurity.

A complete list of 19 elements which, in one or another of the nonferrous alloys, are to be classed as impurities would read as follows: Nickel, cadmium, chromium, antimony, arsenic, bismuth, tin, zinc, lead, iron, aluminum, silicon, magnesium, manganese, phosphorus, sulphur, carbon, hydrogen, oxygen.

It will be noted that copper alone, of all the elements used in nonferrous alloys, is not included in this list. Every other element, in one alloy or another, is considered objectionable in comparatively small percentages. The writer would like to make an exception in favor of nickel, but the fact remains that standard specifications for several of the red brasses and bronzes strictly limit nickel content of those alloys to 1 per cent.

There's Trouble in Switching—The difficulty involved in switching from one alloy to another becomes apparent. In a previous article it was mentioned that alloy changes are most conveniently accomplished with lift-out crucible furnaces. Where a danger of contamination exists, separate crucibles can be used for incompatible alloys. If the incompatibility is not too serious, tilting crucibles can be scraped clean enough for use without much hazard. But any hearth-type furnace lining will retain metal in its cracks and crevices. A portion of this metal is sure to be picked up by later heats and will cause trouble if a danger of trouble exists.

Where the design of the furnace permits, as in the rocking indirect-arc furnace, a spare shell may be kept on hand for use with such alloys as aluminum bronze or silicon bronze. The shell can be changed in an hour or two and the danger of contaminating a red brass or bronze can be avoided. Otherwise, in hearth-type furnaces, we are reduced to a makeshift operation known as a "wash heat." In this practice a small batch of metal, which includes no harmful constituents, is melted and superheated for the purpose of cleaning the lining as thoroughly as possible. The product of the wash heat is commonly of no further use to

the foundry and must be sold to a smelter.

Any discussion of impurities in the nonferrous metals is at present on varying opinions and experiences, hence necessarily controversial. So many elements are likely to be present that the situation is a very complicated one and we have little in the way of scientific experimental evidence. It seems probable that the minor elements in an alloy combine with one another in a different fashion under varying circumstances, thereby producing apparently contradictory results. For example, hydrogen may or may not be injurious depending upon the amount of oxygen present. In the writer's experience, as much as 0.3 per cent sulphur does little harm in a red brass that is otherwise exceptionally pure whereas more than 0.05 per cent is detrimental if the alloy contains the usual amounts of antimony, iron etc. The only really safe procedure in the present state of our knowledge is to keep all undesired elements at the lowest practical level.

Of the 19 elements listed previously, five may be termed incidental—cadmium, chromium, antimony, arsenic and bismuth. Some or all of them may be present in small quantities but, with the exception of minute quantities of chromium in the precipitation-hardening alloys, none of them is ordinarily added to any foundry alloy. Chromium would not be worth mentioning if it were not for the chromium-plated scrap which finds its way back to the foundry melt. We have no evidence that it has ever caused trouble. The cadmium often associated with zinc would be bad if present in the foundry atmosphere, because it is extremely poisonous. Fortunately, it is so much in demand in the electroplating industry that it is carefully separated from the zinc during refining.

Antimony, usually found with lead, may be troublesome in combination with sulphur but we have little definite information about it. When mentioned in specifications it is commonly limited to 0.25 per cent. Arsenic is present in some grades of fire-refined copper and there may also be a little bismuth. In all probability neither of them is particularly important; standard specifications ignore them.

When we come to those elements purposely added to some alloys and undesirable in others our real difficulties begin. These will be considered in the order listed.

Tin is an essential component in most commonly used brass foundry alloys and consequently is likely to be present in the walls of any crucible or melting chamber used for such alloys. It can only be removed by a wash heat. By far the best practice, in cases where tin is not desired, is to use a crucible or furnace not previously used for a tin-bearing alloy.

In one of the silicon bronzes tin is used in combination with silicon. In other alloys in this group and in the aluminum bronzes it is undesirable. In the manganese bronzes tin plays a double role. A small proportion of tin—up to 1.0 or 1.5 per cent greatly improves their corrosion resistance, but even this small amount tends to make them brittle. When a tensile strength of 100,000 lb or more is desired, tin is limited to 0.20 per cent.

Zinc, like tin, is sure to be present in the lining of any furnace used for the foundry brasses and bronzes. It is difficult to remove even by the wash-heat method. Fortunately, in most cases, even when zinc is not desired, its presence in amounts up to 0.50 or 0.75 per cent is not particularly harmful. In monel, however, and in some of the other high-nickel alloys, zinc should be rigidly excluded. It should also be absent in the silicon bronzes except in the series of silicon brasses and bronzes where zinc is the element used in combination with silicon.

Lead, in substantial quantities, is an important constituent of the bearing bronzes. In yellow brass, semi-red brass, red brass and some of the tin bronzes it is purposely used to promote machinability. In a minor way it also tends to close up shrinkage porosity. Otherwise it adds nothing to the properties of the metal and is definitely injurious in castings where maximum strength, particularly at high temperatures, is desired. In high-strength manganese bronze lead is limited to 0.20 per cent, in aluminum bronze to 0.10 per cent, in gun metal to 0.30 per cent, in silicon bronze to 0.50 per cent.

Lead is always present in furnace linings used for lead containing alloys. A wash heat will usually reduce its amount to tolerable limits except for aluminum bronze. In fact, it becomes more and more evident, as we proceed with this study, that the aluminum and silicon bronzes should always have crucibles or furnaces reserved for their exclusive use.

Iron, is a critical element in nonferrous alloys. In some alloys, as described in previous articles, this element is purposely added but always in relatively small quantities which have a pronounced effect on the properties of the castings. In most brass-foundry alloys iron is present as an impurity which must be limited to a point where its effect is neutral. This limit varies from about 0.50 per cent in yellow brass and 0.25 per cent in red brass to 0.15 per cent in the high-strength tin bronzes. In the purchase of composition ingot its presence may be used as an indication of the thoroughness with which the refining operation has been performed. Ingot from a well oxidized melt of the red metals will seldom exceed 0.15 per cent iron.

Where a slight excess of iron is known to be present it can be reduced to tolerable limits by treating with barium sulphate (the grade known as blanc fixe is suitable) or sodium sulphate. This is most effective if done in the furnace during melting, but the crucible or furnace lining will suffer. If done in the ladle the metal should be superheated above the usual temperature, the flux (about 1 per cent of the weight of the metal) thoroughly stirred into the melt and two or three minutes allowed for the chemical action to take place.

Barium sulphate is probably a little slower in its action but has the advantage of making a thicker slag which can more easily be skimmed cleanly from the metal. These sulphates may be termed selective oxidizing agents as their oxidizing effect is limited largely to such impurities as iron, aluminum and silicon. Their regular use is not recommended since they will result in a buildup of sulphur and thus tend to make the metal sluggish. Excessive iron will embrittle the metal, reduce elongation and cause surface stains.

So far we have been considering only iron which is dissolved in the brass. Free iron is an even more serious matter since it inevitably causes hard spots in the castings with resultant tool breakage. Free iron is most likely to find its way into the melt from either of two sources—iron-contaminated turnings or pieces of broken tools in scrap machined castings. Magnetic separation will take care of the turnings but the castings are more of a problem. Either the machine shop must be trusted to put aside castings in which broken tools have been trapped or all scrap castings returned by the shop must be examined. Those found to contain pieces of steel should be set aside until there is a reasonable accumulation. This should then be melted and the steel, which will float, should be skimmed off as soon as the metal is barely molten.

The remaining metal will contain an excessive amount of dissolved iron which can be reduced to tolerable limits by the sulphate treatment already described. Incidentally, a crucible or furnace lining used for this purpose should not subsequently be used for regular foundry metal without a wash heat.

Aluminum, a useful component of many alloys, must be kept out of the red brasses and bronzes, where as little as 0.01 per cent will tend to make the fracture coarse and open. The most likely source of trouble is in foundry returns contaminated with alloys in which aluminum is an intentional element. The sulphate treatment described for iron will clean up metal containing not more than 0.1 or 0.2 per cent aluminum.

Silicon also is poisonous to the red alloys. It behaves much like aluminum and can be treated in the same way. Its presence may be due to contamination by silicon-containing alloys or, in the indirect-arc furnace, may be the result of chemical action. In the nonoxidizing atmosphere and high temperature of this furnace the presence of finely divided carbon from oily turnings or inferior electrodes will reduce silicon from siliceous materials such as sand or furnace refractories. Silicon carbide, a useful refractory in many instances, will contaminate the red metals with silicon if molten metal comes into intimate contact with crystals of the carbide. This hazard exists in any hearth-type furnace but is not encountered in crucibles containing silicon carbide probably because the crystals are covered with a glaze and do not come into direct contact with the metal.

Magnesium is not likely to be found in the brass foundry except as a deoxidant for the nickel silvers. If it does find its way into red brass or bronze it behaves much like aluminum and yields to the same treatment.

Manganese is used with nickel silvers as a desulphurizer and, in the form of black oxide of manganese, is sometimes employed as an oxidizing flux for the red metals. Like iron, it tends to reduce elongation if present in excess, but in quantities below 0.25 per cent, is not particularly harmful. The only correction is to dilute the manganese by using up the off-color metal in small portions.

Phosphorus is used in many of the nonferrous alloys as a deoxidizer. If too much is used it results in fluidity so great as to cause excessive penetration of the metal into mold sand and cores. It also causes embrittlement, reduced elongation and surface stains. In general, the high-zinc alloys have least toleration for phosphorus; toleration increases as the percentage of zinc becomes less and tin becomes the dominant alloying element. In the red brasses and the bronzes of moderate tin content the residual phosphorus, probably combined with copper and tin, may be permitted up to 0.05 per cent. In some of the phosphor bronzes it may reach 0.50 per cent or more. Whenever the residual phosphorus seems too high the best remedy is to discontinue temporarily the use of phosphor-copper as a deoxidizer.

Sulphur in small amounts is always present in the form of one or more sulphides in most of the nonferrous alloys. It originates largely in the fuel used for foundry melting and for smelting secondary ingot. Whether it is harmful or not may depend upon which particular sulphides are present.

Small amounts of copper sulphide probably are harmless, while the sulphides of iron and antimony may be detrimental. We have almost no definite information on this point but experience indicates that in brasses of ordinary purity a sulphur content of 0.10 or 0.12 per cent results in a substantial loss of fluidity with consequent misruns, cold shuts and shrinks. Between 0.05 and 0.10 per cent results are erratic. If sulphur can be kept well below 0.05 per cent no trouble will be experienced.

In the nickel silvers, sulphur must be almost completely removed. This can be done by stirring metallic manganese into the molten metal in crucible or ladle about 2 oz per 100 lb of metal. At least five minutes should then elapse before the metal is finally skimmed and poured. For the brasses soda ash is effective—from 0. 5 to 1.0 lb per 100 lb of metal. This can be added with the charge in the furnace but is really a smelting operation, not to be recommended for every-day foundry use.

Carbon is slightly soluble in brass, according to scanty but rather definite experimental evidence. As such it would probably do no harm, but if it reacts with metallic oxides, which are always present, to form carbon monoxide gas while the metal is in the process of solidification, it might account for some of the gas porosity which plagues the found-

With both hearth-type and crucible furnaces, care must be taken to avoid alloy contamination when the type of metal melted is changed

ryman. Just another of the unsolved brass foundry mysteries.

Possibly the most puzzling of all the mysteries is the subject of gas porosity due to the evolution of dissolved gas during solidification. **Hydrogen** is the commonly accepted culprit, and yet it appears that hydrogen gas can be bubbled through molten brass without any ill effect. One suggestion is that hydrogen causes trouble only when it is *nascent*, that is, freshly released from combination with other elements and hungry to make a new connection. A somewhat different theory supposes that hydrogen, resulting from the breakdown of water at high temperatures, reunites with the oxygen in metallic oxides to form steam within the metal as it solidifies. According to this theory hydrogen will cause no trouble if little or no oxygen is present. In any case, we can be sure that the presence of water vapor in contact with metal during melting is the basic cause of difficulty.

Oxygen as such is probably less responsible for brass foundry trouble than has commonly been supposed. Its presence results in metal loss rather than damage to metal quality. What has been called burned metal is usually nothing more than the discoloration of coarse crystals in shrinkage voids resulting from slow growth at high temperatures. Excessively oxidized metal does develop a viscous oxide slag which is difficult to skim clean and is likely to leave slag spots in the casting.

Throughout this discussion there has been occasional mention of fluxes. In the writer's opinion, fluxes, like drugs for humankind, are needed only to deal with abnormal conditions. If the foundryman starts with good metal and uses proper precautions in handling it, there is little need for fluxes, and their unnecessary use may actually be injurious. It is true that one cannot always avoid the presence of water vapor in the melting chamber; to counteract its evil effects during periods of high humidity, or when furnaces have been newly lined or patched, oxidizing fluxes may be used to advantage. Black oxide of copper or manganese dioxide are most suitable for this purpose. They should be perfectly dry. The amount ordinarily required is about 1 lb per 100 lb of melt, preferably added in the furnace. The flux material is sometimes combined with equal parts of silica sand and fused borax to provide a cover during the superheating period.

The specialized use of sodium sulphate or barium sulphate has already been described. Trade-name fluxes usually contain one or more of these substances with inert materials added to provide bulk and fluidity. Soda ash or fluorspar mixed with lime sometimes is used. It is well to remember that refining impure metals is not properly part of the foundry business. The use of fluxes is recommended only to correct conditions which originate in the foundry itself. Even then, if the need for refining is extreme, it is better to sell the metal to a smelter. Successful fluxing requires expert supervision just as the use of drugs should be based on a doctor's diagnosis and prescription.

Questions and Answers

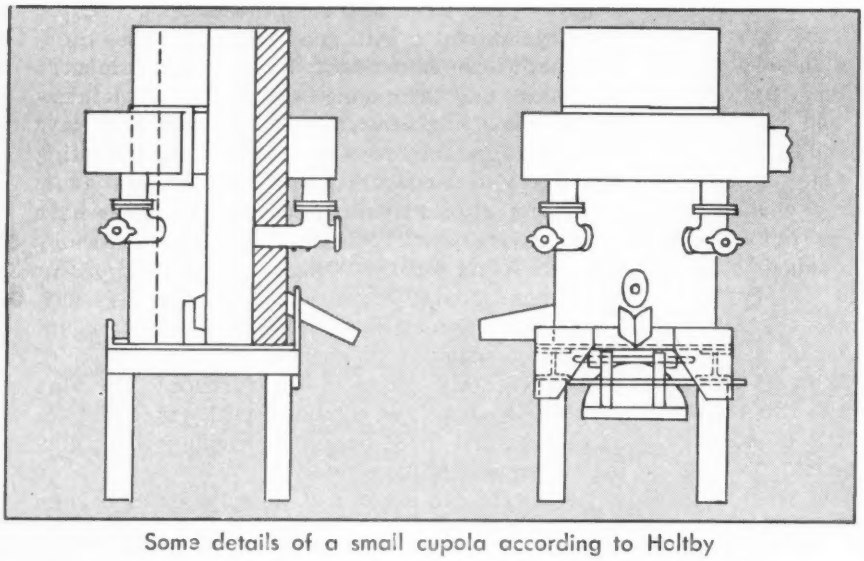
Provides some information on details of construction for a small cupola . . . Wants low cost material for production of duplicate patterns which may be jolted . . . Defect in casting undoubtedly is due to low pouring temperature . . . Holes appear in casting

Constructing a Small Cupola

QUESTION We would like to build an 18-in.-diam auxiliary cupola for small heats and if you can do so, please supply us with all necessary measurements, cfm required, etc.

ANSWER It appears to us that you will be much farther ahead by purchasing a cupola already constructed than to try to make your own, since the size, lined to 18 in., is the smallest commercially available from the several manufacturers.

If you still think you want to build your own, the following data should suffice: The shell is 27 in. in diam which, with the usual 4½-in. brick lining, will provide the 18-in. internal diam. The accompanying sketches, based on a 15-in. cupola developed by Holtby some years ago, show the general arrangement. A windbox about 7 x 10 in. is mounted about 10 in. above the tuyere openings. Four of the latter are used and can be formed of 3½-in. pipe. Connection of the tuyeres to the windbox is made of the same pipe. Instead of fabricating pipe elbows to provide peepholes, tee fittings could be used and should serve satisfactorily.



Some details of a small cupola according to Holtby

Height of the tuyeres above the bottom plate will depend on the thickness of the sand bed and how much iron you want to hold between taps. Since the inside cross-sectional area is 254 sq. in., and one-half the volume of the well or reservoir will be occupied by coke, each inch in height will hold about 33 lb of molten iron. Hence, with a 4-in. sand bottom, the tuyeres located 14 in. above the bottom plate and the slaghole 4 in. below the tuyeres, the well will hold about 200 lb. From the figure given a well for any amount can be determined.

A cupola lined to 18 in. will melt about 1 ton per hr, and the *Cupola and Its Operation* recommends a blower which will supply 640 cfm of air at 8 oz pressure. This volume is slightly in excess of the air requirement of 570 cfm at 7 oz. Coke bed in the cupola may range from 28 to 34 in., and the most suitable height should be determined by experiment. Location of the charging door above the bottom plate will depend on the height of your charging floor above the ground level but should be as high as possible.

Since the inside diameter of the cupola is small, we believe that the unit should be made in two sections, with the lower part about 4 ft high and designed so that it can be moved from beneath the upper section. This arrangement will permit patching of the melting zone from above without much difficulty.

Producing Duplicate Patterns

QUESTION Can you advise us whether there is a pattern mounting compound similar to plaster of paris matching bond which will stand jolting on a molding machine? The material should not have any shrink, and we would like to make the copes as well as the drags to match. In other words, we would like to jolt the cope and drag at the same time, and if there is any shrinkage in the compound when it dries or hardens, the parting will not match up with the patterns.

ANSWER For the purpose you have in mind—production of duplicates of patterns as inexpensively as possible—we believe that you will find the material called "pattern mounting compound" will serve, and can be employed where the patterns are jolted. To attain the best results, instructions of the manufacturer on handling the material should be followed carefully. Your attention also is directed to use of castable resins for making of the patterns and/or plates.

Pour at Higher Temperature

QUESTION We are having trouble producing cast alloy iron valve seat inserts, and for your information are forwarding three specimens, including one as-cast and the other two machined. You will note that the machined specimens show interdendritic shrinks. Castings are made in green sand molds and poured from a crucible in the temperature range of 2650 to 2750°F.

ANSWER While you do not indicate the method of making the valve seat inserts, we assume that they are produced by stack molding using small thin gates into the casting cavities. Since the castings have relatively small cross sections, it is essential that they be poured at high temperature. We believe that your trouble arises from too low a temperature. Although you mention a pouring range of 2650 to 2750°F, it might be pointed out that if the temperature is measured at the furnace, it will be at least 50° lower at the mold side.

Our suggestion is to pour at the highest possible temperature. In fact, one firm to avoid difficulties from

temperature drop in transfer handling of molten metal, brings the molds to the furnace and pours directly from the furnace. Melting temperature is around 2800°F, and there is little if any loss in temperature with this arrangement.

Holes Appear After Machining

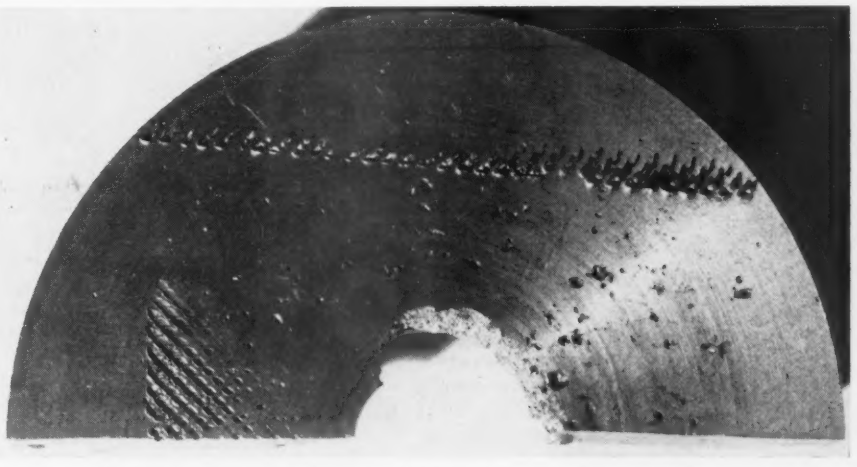
QUESTION We are sending for your consideration one-half of an aluminum gear box casting with which we are having trouble as indicated by the appearance after machining. Alloy is No. 108 containing 4 per cent Cu and 3 per cent Si. It is melted in an oil-fired 300-lb crucible furnace and poured at 1400° F, using some chills in the drag. Sand is a mixture of Nos. 1 and 00 Albany with a little Juniata bank sand, giving us a good four-screen spread from 100 to 240-mesh. The as-cast surface looks very good and machined *samples* were good. Casting and gates are in the drag and the runner in the cope, as indicated in the sketch. Three castings are on a 10 x 22 plate. Cope and drag are 4 in. Trouble may be due to hydrogen porosity, too hard a cope, oxide dross coming through the gating system or shrink porosity. Can you tell us the cause of the defects?

ANSWER Examination of the half casting indicates that your trouble probably is due to a combination of gas absorption during melting and air entrainment during pouring. High-temperature melting, indicated by a pouring temperature of 1400°F, will permit greater absorption of gases than when temperatures are lower. We are sure that the castings can be poured satisfactorily at a lower temperature, and suggest that you try reducing it 25° at a time until cold shuts are encountered. Then go back to the temperature just above that which produces satisfactory results.

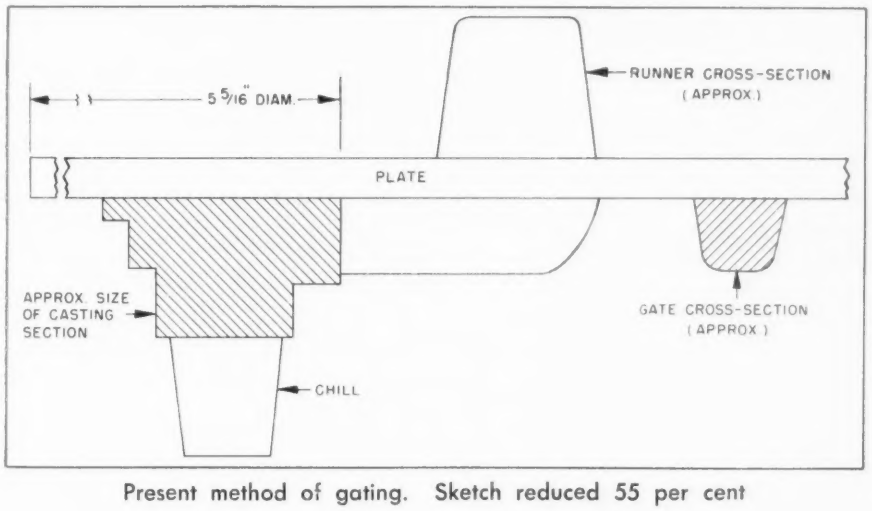
With lower melting temperature, rapid melting and pulling the pots from the furnace when they are up to temperature, you should hold gas absorption to a minimum. Possibly you may want to try one of the numerous solid or gaseous degasifiers or mechanical equipment used for degassing purposes.

While you do not give complete information on your gating system, we suspect possible air entrainment. We suggest that you use a tapered sprue with an opening about ⅝-in. in diam where it is attached to the runner. We do not believe that your present pattern and flask arrangement will permit an enlargement at the base of the sprue in the drag, but if there is space, we suggest doing so. Also, if not already done, we suggest you extend the end of the runner as far as possible beyond the gate to the last casting.

Research on gating of aluminum castings indicates that your present system should be reversed. In other words, the runner should be in the drag and the gates in the cope. We suggest, therefore, that you make some molds with the positions of the cope and drag interchanged and check the results. In addition, if this is not a cast matchplate, you might try substituting a gate ¼-in. high and 2¼ in. wide for the one now used.



Face of casting after machining shows numerous holes



Present method of gating. Sketch reduced 55 per cent

Silicon Carbide Forms Chill

QUESTION We have brief information that semipermanent or permanent cope and drag molds are being made of silicon carbide or a similar material such as commonly used in crucibles. We understand the product is being used in the casting of railroad carwheels. Our operation is confined entirely to aluminum castings in sand molds from either matchplates or cope and drag plates. We are interested in obtaining any information on the subject previously mentioned.

ANSWER While there have been mentions in the literature of using silicon carbide in production of castings, the usual application is to promote more rapid solidification or chilling. In other words, the material is used only in portions of the mold. The silicon carbide may be used as solid pieces or in the crushed

or powdered form. In the latter case it is bonded with clay or other material, as would be the case with silica sand.

Your mention of the material being used for production of railroad carwheels undoubtedly refers to the recently developed practice of using graphite molds for casting steel wheels. Those molds are machined from solid blocks of graphite, and the molten steel is forced up through a tube from the ladle into the bottom of the mold by air pressure. When the mold is filled, the bottom opening is plugged or stopped off, and the molten steel in the pouring tube is allowed to drain down into the ladle. Complete description of the process is presented in "Pressure Pouring and Graphite Permanent Molds Used in Production of Steel Car Wheels" by H. H. Hursen in *Transactions* of the American Foundrymen's Society, Vol. 63, 1955.

With reference to silicon carbide, you might be interested in a proposed suggestion of bonding the crushed material with sodium silicate and gassing with carbon dioxide for making chills.

Temperature May Be Trouble

QUESTION We have been experiencing a defect in some of our brass castings used in the plumbing field, and are sending you three specimens for examination. Can you tell us what is the cause?

ANSWER Examination of fractures of the castings shows two things. One is a yellowish "cokey" structure along the cored surfaces, in contrast to a dense grayish structure along the surfaces in contact with the sand mold. The other point is the presence of inclusions which in some cases appear to be dross and in others particles of sand.

The yellowish structure, in our opinion, is due to high pouring temperature which, in turn, may result from improper gating. We suggest, therefore, that you first try decreasing the pouring temperature and see what results are obtained. That can be ascertained easily by fracturing the castings and observing the structures. If lower pouring temperature does not eliminate the trouble, then the gating will have to be changed.

You also might check to see if you are trying to fill too many molds from one crucible. This practice usually means that the first molds are poured with exceedingly hot metal in order to obtain a suitable temperature for the remaining molds. We suggest determining the temperatures at the beginning and end of pouring a crucible of metal. If the temperature drop is too great you will be much better off to reduce the number of molds poured.

Presence of dross and sand particles in the castings indicates carelessness. Perhaps the furnacemen and pourers are in too much of a hurry and do not skim the metal properly. A little more time and care should cure that trouble. Presence of sand particles means that the molds are not clean. It may be that the core prints may be "off" in some cases which breaks the edges of the mold, or the molder gets a little careless in setting the cores. Blowing out the mold carefully after setting the cores should take care of any loose sand.

Indicates the Binder and Gas

QUESTION In a recent issue of FOUNDRY a statement concerning CO_2 hardened cores mentioned that 4 per cent silicate binder is used at the rate of 0.2 to 0.3 per cent of the weight of the sand. How is this 4 per cent solution determined? Are commercial solutions of sodium silicate standardized at 100 per cent?

ANSWER Your reference to an article in FOUNDRY on the CO_2 process evidently was to "Dos and Don'ts in Hardening Sand With CO_2" by Gotheridge and Pursall which appeared in the March issue. You evidently misread the statement, since it mentions two different things—binder and CO_2. The 4 per cent refers to the amount of silicate binder and the 0.2 to 0.3 per cent is the quantity of CO_2 required on a weight basis for theoretical conversion of the silica to silica gel.

Silicate binder manufacturers have their own special formulas which include, in addition to the sodium silicate, some organic additive. Water content appears to be about 25 per cent so that when 4 per cent binder is added to the sand, the moisture content of the mix is 1 per cent.

Scrap Breaking Operations

QUESTION We will appreciate advice on overcoming the danger from flying pieces of scrap resulting from scrap breaking operations. Our operation is done in the yard by an 80-ft span bridge crane using a drop ball.

ANSWER Protection from flying pieces of scrap during breaking operations requires some type of enclosure. Since it would be rather expensive to fence a large area, the logical procedure would be to select an area in which the largest piece can be accommodated, and enclose it. Such an arrangement may require extra handling, but it is the safest one.

Possibly your state has regulations defining a suitable enclosure or guard for such operations; check them before going ahead. An AFS publication of some years back states: "The breaking of castings or scrap by use of a drop inside the foundry buildings during working hours shall be prohibited unless such operations are performed within a permanent enclosure consisting of not less than 2-in. planking or equivalent protection. Such enclosures shall be of sufficient height to protect workmen in the vicinity from injury by flying fragments of metal."

If the castings to be broken are placed in a pit several feet deep, the surrounding enclosure need not be as high as in the case of ground level operation, particularly if the pit dimensions are only slightly more than those of the piece being broken. For effective breaking, the enclosure or pit should have a thick concrete foundation and the top armored with steel plate or with cast-in grids. In some instances where old, discarded railroad ties were available at only the hauling cost, the breaking area has been floored with that material for better distribution of the load on the ground.

Suggests Booking the Cores

QUESTION We have tried the CO_2 coremaking process as described in the January and March issues of FOUNDRY, and have some excellent results. However, we have run into some difficulty with some of our older coreboxes of the split type which require pasting of the two parts. Could you tell us what type of paste could be used since those containing water do not seem to work? Also could you advise us on a type of blacking that could be used on cores for bronze and aluminum castings?

ANSWER For pasting the sectional cores together, one of the volatile base type should serve satisfactorily when used according to the manufacturer's directions. However, it appears to us that the pasting operation could be eliminated by "booking" the two boxes together before gassing. The gassing of the one-piece core could be accomplished by drilling small holes through the boxes at appropriate points, or perhaps injecting the carbon dioxide gas through the print area.

Blackening or coating of cores for brass and aluminum generally is not done, because it is claimed that good surfaces are obtained without such application. Possibly the sand you are using is too coarse for the desired surface finish. If you feel, however, that coating is necessary, a volatile-base type will serve. Water-base type can be used, but it should be thick, applied quickly, and the core dried immediately by heating.

A typical Iroquois product . . . a marine motor housing.

"We recommend this machine to all foundries"

Says Mr. Walter Vierthaler, Vice-President of Iroquois Foundry Co., Racine, Wisconsin, where high quality grey iron castings are produced. Here approximately 300 tons of mulled sand are conditioned each night with a Royer NYP-E Sand Separator & Blender.

Front end loaders deliver the sand from the muller to the molding station. The original practice was to dump this sand on the molders heap, caked and packed from mulling and bucket loading. Now the sand is charged into the large hopper of The Royer instead. No time has been added to the cycle of operation, but the molders heap has been transformed to a cool fluffy pile. When one floor is completed, the highly portable Royer is moved to the next. Scrap loss and cleaning room time are down and casting finish has been improved.

All mulled sand can be vastly improved by proper aeration and fluffing. The best place for this operation is at the molding station where the sand will not be compacted by further handling prior to the molding operation. For a bucket loader type of operation we recommend the new Royer NY series. Write for bulletin NY-54 today.

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Men of Industry

HOWARD F. PARK JR.
. . . president, SFSA

A. O. WILLIS
. . . manufacturing manager

CLAYTON A. O'NEILL
. . . joins Wellman Bronze

RICHARD C. MELOY
. . . GIFS marketing director

HOWARD F. PARK JR., recently elected president of the Steel Founders' Society of America, is vice president-sales, General Steel Castings Corp., Granite City, Ill. Mr. Park was graduated from University of Pennsylvania and for 16 years was associated with Western Electric Co., Kearny, N. J., and the Budd Co., Philadelphia. In 1942 he joined General Steel Castings Corp.'s Eddystone, Pa., plant, where he became district manager of sales in 1950. He was transferred to Granite City in 1952 as manager of sales and was named vice president-sales in 1954.

Frederick Walker and **Francis H. Eichler** were named vice presidents, American Smelting & Refining Co., New York. Mr. Walker continues in charge of Federated Metals Division, a position he has held for the past year as assistant to the president of American Smelting. Mr. Eichler, who since 1952 has been director of purchases for the parent company, will continue as vice president in charge of the purchasing department.

Gene Passman, recently in charge of foundry facings testing and promotion, Foundry Supply Department, Frederic B. Stevens Inc., Detroit, has been named head of foundry facing sales. He joined the company 11 years ago and previously worked in the product development and customer service laboratories.

John Kunysz was appointed chief chemist in the Fontana, Calif., plant, Black Products Co., Chicago, producer of foundry facing materials.

A. O. Willis recently joined National-U. S. Radiator Corp., Johnstown, Pa., where he will be manager of manufacturing for the company's 12 plants. Mr. Willis has a background of more than 20 years experience in engineering, manufacturing and quality control operations.

Clayton A. O'Neill, until recently superintendent of the Light Metals Division, Thompson Products Inc., Cleveland, was appointed manager of the Permanent Mold Division, Wellman Bronze & Aluminum Co., Cleveland. Mr. O'Neill attended Fenn College and Case Institute of Technology, and previously was associated with American Magnesium Division, Aluminum Co. of America, Pittsburgh.

Anthony J. Astrologes and **Ivan A. Dickey** were elected vice presidents, Indiana Steel Products Co., Valparaiso, Ind. Mr. Astrologes, who has been with the company since 1948, is also a director and treasurer of the company. Mr. Dickey, now vice president in charge of sales, joined Indiana Steel in 1948 and became sales manager in 1953.

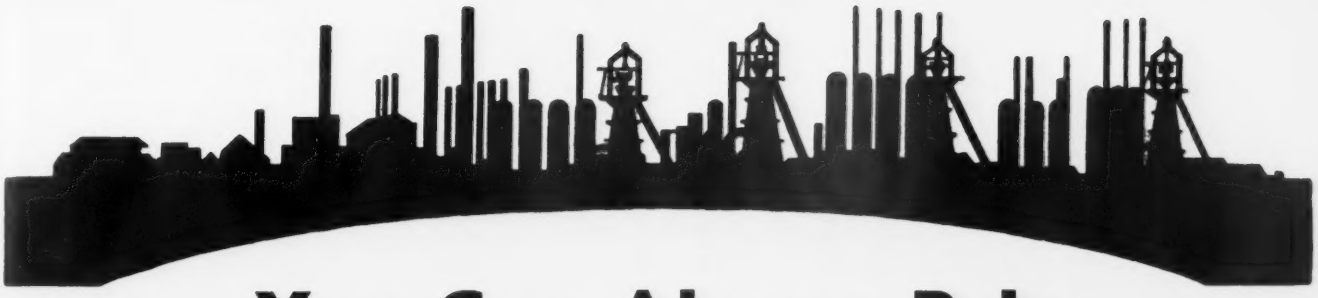
L. W. Williamson recently joined the Foundry Supply Co., Minneapolis, as foundry consultant. For the past 22 years he was foundry superintendent, Minneapolis-Moline Co., Hopkins, Minn. Mr. Williamson has spent 50 years in the foundry industry.

John B. Hinds has been named specialist for planning and development of improved methods for increased production of gray iron castings at General Electric Co.'s foundry in Elmira, N. Y. Since 1953 he has been a sales engineer for the company's chemical materials department, working out of the Chicago office.

Richard C. Meloy has joined the Gray Iron Founders' Society, Cleveland, as marketing director. He will direct a broad, new marketing program to include marketing seminars, application of business statistics, market trends, sales forecasts and product development activities. Mr. Meloy was graduated from Trinity College in 1932 and until recently was manager of market research for Delco Appliance Division, General Motors Corp., in Rochester, N. Y.

Dr. James I. Hoffman has been appointed chief of the Metallurgy Division, National Bureau of Standards, Washington, succeeding **Dr. John G. Thompson,** retired. Dr. Hoffman, recently assistant chief of the bureau's Chemistry Division and chief of the Surface Chemistry Section, joined the bureau staff as a chemist in 1919. Graduated from Franklin and Marshall College, he received his master's degree from George Washington University, later receiving his doctor's degree from American University.

Samuel W. Gearhart Jr. was appointed sales and service engineer, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. A graduate of Pennsylvania State University, Mr. Gearhart was metallurgist and super-



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(15) top-charge always in alignment
(16) all parts exposed to excessive heat are amply water-cooled
(17) smooth hydraulic operation of electrodes, furnace tilt, roof lift, and swing

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. . . Southern sales, Shalco

STEPHEN S. CONWAY
. . . American Brake Shoe v. p.

SAMUEL STANTON
. . . joins Claud S. Gordon Co.

PATRICK E. DEMPSEY
. . . joins Kensington Steel Co.

vising metallurgical engineer, Baldwin-Lima-Hamilton Corp., Eddystone, Pa., for the last nine years.

John Herbert, formerly field service engineer, Shallway Corp., Connellsville, Pa., was appointed Shalco field service engineer for Southern Mill & Foundry Supply Co., Gastonia, N. C. The latter recently was formed for sale of the company's shell molding equipment in the South. Mr. Herbert joined Shallway Corp. three years ago. **Harvey Black** has been named Shalco shell molding service manager for Southern Mill & Foundry Supply Co. Until recently he was president of Black's Foundry, Gastonia.

Edward J. Henzerling, Cincinnati, has been appointed sales representative of industrial belting, C. R. Daniels Inc., Daniels, Md., to cover Ohio, Kentucky, Tennessee, and part of Indiana and West Virginia. **E. E. Keen,** formerly assigned to this territory, will represent the company in part of Illinois, Indiana, Kentucky, Tennessee, Arkansas, and all of Missouri and Kansas, with headquarters in St. Louis. Mr. Keen joined the company in 1953.

Stephen S. Conway, president of the Brake Shoe & Castings Division, has been named a vice president of American Brake Shoe Co., New York, the parent company. Mr. Conway joined Brake Shoe in 1912, and became a sales representative of the Brake Shoe & Castings Division in 1929. He was named vice president of the division in 1947, first vice president in 1952, and president in 1955.

E. W. Valensi was elected president, North American Refractories Co., Cleveland, succeeding **Harvey E. Stuhler,** who was named chairman. Mr. Valensi, until recently first vice president-treasurer, joined the company in 1929 and previously served as secretary and comptroller. **H. H. Hopwood** was named first vice president of the company, and **J. A. Stott** succeeds him as vice president-sales. **R. E. Byrne** was named treasurer and **Mrs. S. P. Pejeau** was re-elected secretary.

Samuel Stanton recently joined Claud S. Gordon Co., Chicago, as Detroit district manager, with headquarters at 2832 East Grand Blvd. For the past 10 years Mr. Stanton was a manufacturers' representative in the Detroit area.

Patrick E. Dempsey has been appointed chief metallurgist, Kensington Steel Co., subsidiary of Poor & Co., Chicago. Mr. Dempsey was graduated from Queens University, Kingston, Ont., and was previously associated with Dominion Iron & Steel Ltd., Sydney, Nova Scotia, and Aluminum Co. of Canada Ltd. and Sorel Steel Foundries Ltd.

William F. Schlick was appointed western regional sales manager, Sterling Grinding Wheel Co., Tiffin, O., with headquarters at 3145 West 47th St., Chicago. **James L. Goodwin,** appointed sales manager for the

EDWARD J. HENZERLING
. . . joins C. R. Daniels Inc.

E. E. KEEN
. . . Dandux belting sales

WILLIAM F. SCHLICK
. . . western regional sales

JAMES L. GOODWIN
. . . eastern regional sales

D. G. PHILLIPS
. . . sales-service mgr.

E. O. BROWN
. . . Muncie Malleable supt.

T. W. HENDRICKS JR.
. . . joins Muncie Malleable

HUGH C. RILEY
. . . Erie Strayer sales

eastern region, will be located at 2333 St. Clair Ave., Cleveland. Messrs. Schlick and Goodwin were formerly district managers for the company.

E. O. Brown was appointed superintendent, **D. G. Phillips,** sales-service manager, and **T. W. Hendricks Jr.,** comptroller, Muncie Malleable Foundry Co., Muncie, Ind. Prior to joining the company in April, Mr. Brown was associated with Dayton Steel Foundry Co., Dayton, O., Gunite Foundries Corp., Rockford, Ill., and Lunkenheimer Co., Cincinnati. Mr. Phillips has been with the company for many years, serving both as production manager and superintendent. Mr. Hendricks, formerly with Union Malleable Mfg. Co., Ashland, O., previously was with Firestone Tire & Rubber Co., Akron, O.

Wendell P. McKown Jr. was elected vice president-manufacturing, Cooper Alloy Foundry Co., Hillside, N. J. Prior to joining the company in 1952, for 10 years he was purchasing agent for Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn. **Robert H. Burks Jr.** has succeeded Mr. McKown as works manager of the foundry and aircraft divisions. A graduate of Purdue University, since 1952 Mr. Burks was general manager of Heil Co.'s Hillside, N. J., and Lancaster, Pa., manufacturing plants.

C. J. Schmidt was named executive vice president, J. O. Ross Engineering Corp., New York. **W. K. Metcalfe** has succeeded Mr. Schmidt as vice president-sales, and has been made a director. **J. M. Petix** was elected secretary, a position formerly held by Mr. Metcalfe. Mr. Schmidt, with the Ross organization for 26 years, is a graduate of University of Wisconsin and previously was in charge of the company's Detroit office. Mr. Metcalfe joined the company in 1936 after graduating from University of Colorado and in addition to his duties as secretary was an executive in sales and engineering with Ross Engineering. Mr. Petix was graduated from City College (New York) and during 30 years with the company has been engaged in design, development and sales engineering of specialized dryer and oven systems.

Hugh C. Riley was named district representative, Erie Strayer Co., Erie, Pa., to handle the company's line of clamshell buckets in western New York, western Pennsylvania, West Virginia, Kentucky, Ohio, Michigan, Indiana, northern Illinois and Wisconsin. He attended Otterbein College and has spent 8 years in the sale of construction machinery, power cranes and shovels.

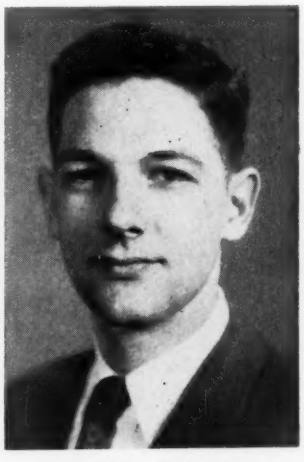
Selden T. Williams, general manager, A. Schrader's Son, Division of Scovill Mfg. Co., Brooklyn, N. Y., was recently named a director of Scovill Mfg., the parent company.

Robert N. Hamilton and **Robert P. Cooper,** formerly field engineers in the Los Angeles district office, Norton Co., Worcester, Mass., have been named abrasive engineers and will each cover part of the city of Los

ROBERT H. BURKS JR.
. . . works mgr., Cooper Alloy

WENDELL P. McKOWN JR.
. . . Cooper Alloy v. p.

ROBERT P. COOPER
. . . Norton abrasive engineer

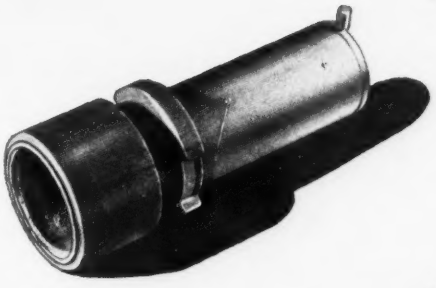


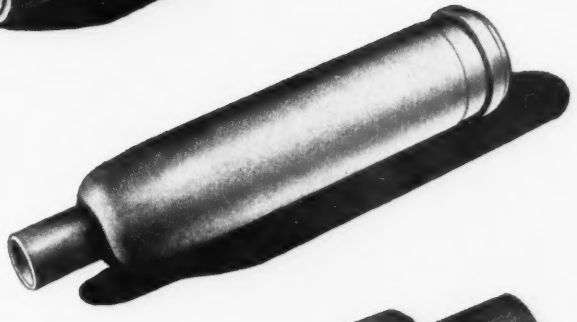
ROBERT N. HAMILTON
. . . abrasive sales, Norton Co.

ACME RESIN

PROOF OF PERFORMANCE

Hollow Cores for Shell Molding Stronger, Faster, Cleaner—with





THE PlastiSand® PROCESS

In the PlastiSand Process, each grain of sand is uniformly coated with partially polymerized thermosetting resin.

Permanent, even distribution of the liquid resin throughout the sand results in higher strength and cleaner finishes.

With the PlastiSand Process, a shorter dwell and faster cure means increased production, too!

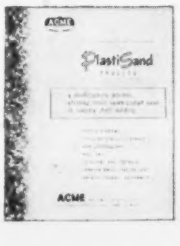
One foundryman reports that with a particular hollow core, the *only* successful method of production was with the PlastiSand Process.

PLUS THESE FACTORS

1. **ECONOMY** . . . Foundries using the PlastiSand Process report superior molds with as little as one-half the resin content formerly necessary with dry resin.
2. **NON-SEGREGATING** . . . Each grain of sand is completely and uniformly coated with liquid phenolic resin in the PlastiSand Process—segregation cannot occur.
3. **DUST FREE** . . . Because liquid-resin is used there is no dust. An invaluable safety and health factor. The absence of dust means healthier working conditions, no irritating dust fumes, no danger of dust explosive.
4. **NON-CLUMPING** . . . Sand, treated with the PlastiSand Process is always free pouring—regardless of temperatures.
5. **GREATER PRODUCT UNIFORMITY** . . . Because it is non-segregating, resin-coated sand prepared by the PlastiSand Process yields almost identical molds, batch after batch.

The PlastiSand Process offers advantages for *all* shell molding foundries, *all* shell molding jobs. It is adaptable to dump-box, roll-over and blowing of either shells or cores.

This informative booklet may be obtained by writing to Acme Resin



ACME RESIN CORPORATION
1401 CIRCLE AVENUE • FOREST PARK, ILLINOIS

Resin formulation and the coating process covered by Patents 2,706,163 and 2,706,188

Angeles. Mr. Hamilton, a graduate of Worcester Polytechnic Institute, joined Norton Co. in 1948 as a manufacturing control engineer. He was transferred to sales in 1950. Mr. Cooper was graduated from University of Michigan and became a Norton trainee in 1952.

Charles L. Holbert has been appointed executive vice president, H. K. Porter Co., Pittsburgh, succeeding **Clarence R. Dobson,** retired. Mr. Dobson, with the company since 1946, will continue as a consultant. Mr. Holbert joined Porter Co. earlier this year as a vice president. He had been executive vice president of Southern Pacific Milling Co., Ventura, Calif.

Roy A. Jacobsen was elected executive vice president, Carondelet Foundry Co., St. Louis. **John H. Culling** was named vice president-operations; **Warren W. Brown,** vice president-sales; and **Milton W. Stanze,** secretary-treasurer.

Richard Herold was appointed general sales manager, Harrisburg Steel Corp., Harrisburg, Pa. He will continue to serve as vice president-foundry sales of the company's Taylor-Wharton Division, High Bridge, N. J.

G. L. Hartmann, president, Milwaukee Faucets Inc., Milwaukee, was named first vice president of the Plumbing Brass Institute, a newly formed trade association.

William L. Parlon was appointed branch manager of an office recently established at 4385 North Green Bay Ave., Milwaukee, by Baker-Raulang Co., Cleveland. Mr. Parlon is a graduate of Purdue University.

Benjamin J. Davis was named general manager and sales director, Athol Machine & Foundry Co., Athol, Mass. Mr. Davis was formerly sales manager, Trimont Division, Pierre Chain Corp., Worcester, Mass.

RICHARD E. WHINREY

. . . elected a vice president of Link-Belt Co., Chicago, as reported in the May issue. Mr. Whinrey's company was incorrectly identified in the caption

Raymond L. Howerton was appointed assistant manager of the sales promotion department, Hyster Co., Portland, Oreg. He joined the company 6 years ago as manager of promotion for the tractor equipment division and in 1954 became manager of the sales training division of the sales promotion department.

William J. Martin Jr. was recently appointed sales manager, Smith Facing & Supply Co., Cleveland. **Raymond Crosby** continues as sales and foundry engineer. For the past 16 years Mr. Martin was representative in Detroit, Cincinnati and Cleveland for Peninsular Grinding Wheel Sales Corp., Detroit.

A. E. Schneider retired recently as president-general manager, Stedman Foundry & Machine Co., Aurora, Ind. He was associated with the company since 1929 and was vice president of the company in 1949 when it became a subsidiary of United Engineering & Foundry Co., Pittsburgh. New officers of the company include: **G. G. Beard,** chairman; **K. C. Gardner Jr.,** president; **Lester Etter,** executive vice president - secretary; **M. P. Sieger,** vice president; **G. V. Lang,** treasurer; and **C. T. Zinsmeister,** assistant secretary-treasurer.

Joseph L. Lessman was appointed plant manager of the foundry division, Cooper Alloy Corp., Hillside, N. J. A graduate of Missouri School of Mines and Metallurgy, he joined the company as assistant foundry superintendent in 1946 and became foundry superintendent in 1953. Previously he was associated with Fort Pitt Steel Casting Co., McKeesport, Pa., and American Steel Foundries, Chicago.

Henry M. Wood, Cincinnati, was named a director, Ross Operating Valve Co., Detroit. A manufacturers' representative for industrial equipment in Ohio and Kentucky, he has been a Ross Valve representative since 1940. Mr. Wood was graduated from Cornell University, and was previously associated with Lodge & Shipley Machine Tool Co., Cincinnati. He formed his own company in 1928.

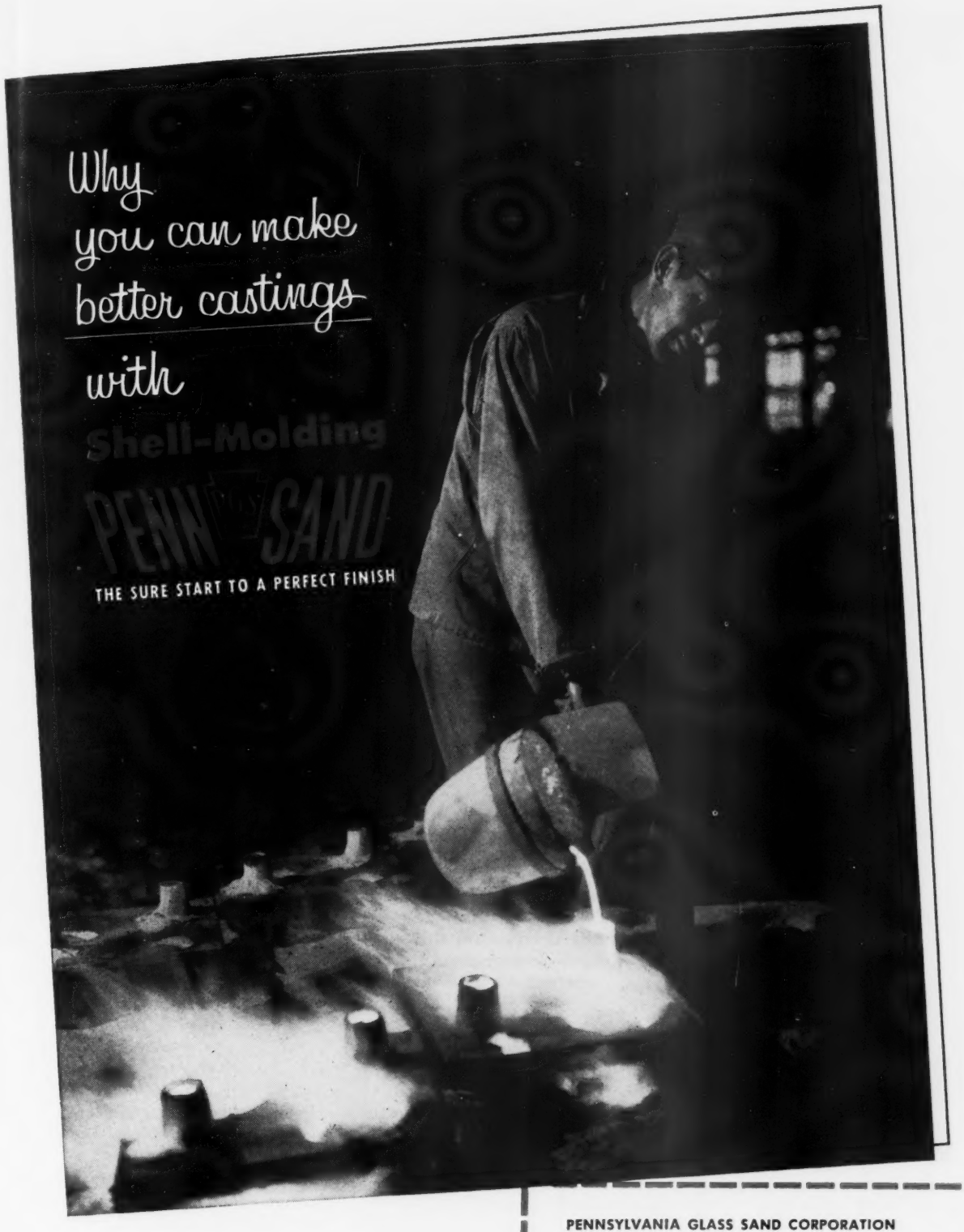
Clair Crawford recently joined Thiem Products Inc., Milwaukee, as general sales manager. Mr. Crawford was formerly associated with Frederic B. Stevens Inc., Detroit, where he specialized in development and application of foundry facings and became foundry division sales manager in 1953.

WILLIAM L. PARLON
. . . Milwaukee branch mgr.

RAYMOND L. HOWERTON
. . . sales promotion, Hyster Co.

WILLIAM J. MARTIN JR.
. . . sales mgr., Smith Facing

CLAIR CRAWFORD
. . . joins Thiem Products Inc.



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EDWARD J. METZGER
President

CHARLES J. EGETTER
First Vice President

P. E. LANKFORD
Second Vice President

JAMES W. WOLFE
Secretary-Treasurer

James W. Wolfe (left), society secretary-treasurer, is presented an engraved silver tray by William A. Meissner Jr., BDSA, Washington. Background photos were surprise joke on W. L. Leopold, retiring president

Non-Ferrous Founders' Society

Holds Annual Meeting at Atlantic City

ANNUAL meeting of the Non-Ferrous Founders' Society provided an interesting program for the many representatives present from its 350 company members. The meeting was held at the Marlborough-Blenheim Hotel, Atlantic City, May 3.

In the annual election of officers, E. J. Metzger, Multicast Corp., Wauseon, O., was named president to succeed William L. Leopold, Northern Bronze Corp., Philadelphia. Charles J. Egetter, Crown Brass Mfg. Co., Los Angeles, was elected first vice president, and P. E. Lankford, East Birmingham Bronze Foundry Co., Birmingham, is the new second vice president. James W. Wolfe continues as secretary-treasurer at society headquarters in Chicago.

Executive committee for the coming year, in addition to Mr. Leopold, includes M. E. Nevins, Wisconsin Centrifugal Foundry Co., Waukesha, Wis.; A. J. Messmer, Messmer Brass Co., St. Louis and R. W. Sweitzer, I. S. Spencer's Sons Inc., Guilford, Conn.

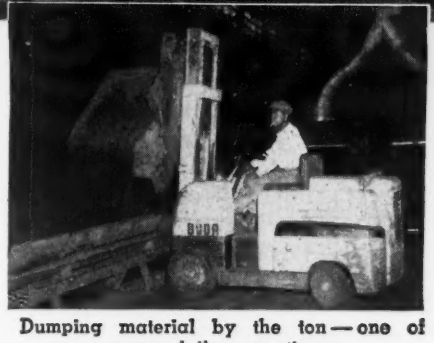
Messrs. Metzger and Nevins and the following were elected directors for three years: H. D. Fishel, Arrow Acme Corp., Webster City, Iowa; D. E. Broggi, Neptune Meter Co., Long Island City, N. Y.; K. R. Proud, the Anstice Co., Rochester, N. Y., and William J. Meakin, R. B. Carolin Foundry & Machine Co., Detroit.

Mr. Leopold presided at the morning session, which was devoted principally to reports of officers and committees. Robert Langsenkamp, Langsenkamp-Wheeler Brass Works Inc., Indianapolis, chairman of the Insurance Committee, reported that 3400 individuals now are covered by the comprehensive insurance plan sponsored by the society.

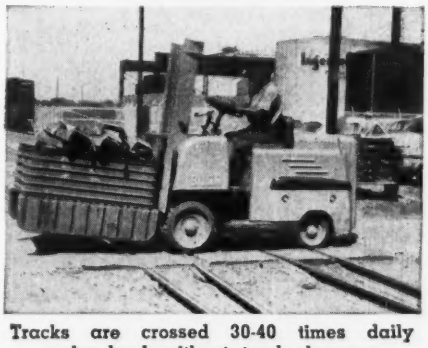
Reporting for the Cost Committee, William A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland, described the formation in the Cleveland Chapter of a cost group to provide a means for individual foundries to check on their departmental costs.

This, the first group, established late last year, is in the nature of an experiment, but Mr. Gluntz said that results justify the recommendation that similar groups be installed in

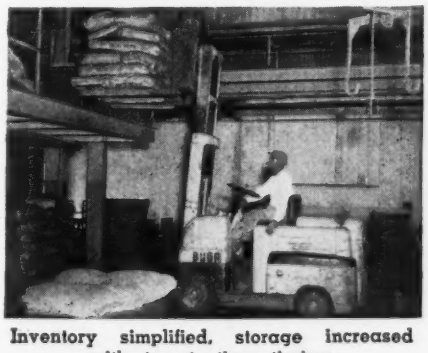
ALLIS-CHALMERS FORK TRUCKS



Dumping material by the ton—one of many daily operations.



Tracks are crossed 30-40 times daily under load without truck damage.



Inventory simplified, storage increased with ton-at-a-time tiering.

Cut Handling Time 30% at Chicago Malleable Castings Co.

In two years, Chicago Malleable Castings Co., a leading mid-western foundry, has been able to reduce handling time 30% on all materials handled with an Allis-Chalmers FT60-24 Fork Lift Truck.

In specific instances, such as the boxcar unloading of refractory brick, the truck has reduced by 90% the handling time formerly required by conveyor system.

Equipped with a rotating device, the truck is also used for handling foundry sand and other bulk materials, and also for loading, transporting, and unloading such products as bonding clay, machinery, and rough castings. All these operations have been accomplished more efficiently and in less time than was possible with equipment formerly used.

So impressive has been this performance record, that Chicago Malleable recently purchased another Allis-Chalmers truck for use in other areas of their modern plant. Used primarily for handling finished castings, including trailer-truck and boxcar loading, this truck handles 140 tons of materials in an average eight-hour day.

But utility is only part of the story. Maneuverability, ease of handling, low maintenance, and dependable, long-lived operation — even under adverse foundry operating conditions — are all features combined in every Allis-Chalmers Fork Lift Truck. It's the winning combination for progressive foundries throughout the country.

ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

Write today for your free copy of our 36-page, fact-filled booklet which explains in detail the many exclusive features that make Allis-Chalmers Fork Lift Trucks the choice of industry everywhere.

ALLIS-CHALMERS A-C

BH-2

other chapter areas.

It was announced that Herbert F. Scobie, editor, *Modern Castings,* would join the society's home office staff as field manager about Aug. 1.

A luncheon meeting, sponsored jointly by the society and the American Foundrymen's Society, provided discussion on the subject of what the casting buyer expects from the foundryman. The topic was presented in talks by two purchasing agents.

E. J. Schwarz, DeLaval Steam Turbine Co., Trenton, N. J., said his company selects a casting supplier on the basis of price, delivery and product quality. Because many of the units it builds are tailor-made, the company expects a quotation on castings to remain firm for at least 30 days. It also counts on the supplier to make rush deliveries in emergencies.

The company uses a form to advise foundries regarding rejected castings and to make recommendations for correction of the trouble. Mr. Schwarz said some foundries are reluctant to suggest pattern changes. He urged that they offer suggestions, especially where costs can be cut.

George W. Partington, commercial and industrial air conditioning department, General Electric Co., Bloomfield, N. J., rated the factors influencing casting purchases on this basis: Quality, 40 per cent; price, 35 per cent, and service, 25 per cent. The company's operations require that receipt of parts be regulated closely to meet production schedules; hence service from suppliers is important. Foundries are asked to quote on pattern equipment and be responsible for its selection.

Mr. Partington expressed surprise at the wide range of quotations sometimes received on castings. He cited the instance of a permanent mold aluminum casting weighing 4 to 5 ounces of which the company required 120,000 pieces in one year. Prices quoted per piece ranged from 15 cents to 36 cents.

Representatives of the Copper and Aluminum & Magnesium Divisions of BDSA, Washington, addressed the society at the afternoon session on the outlook for nonferrous metals. William A. Meissner Jr., deputy director of the Copper Division, pointed out that despite shortages of copper and copper scrap, shipments of copper-base foundry product last year were the second largest since World War II.

Scrap exports have been pared from their high of 51,000 tons in the first quarter of 1954 to around 10,000 tons per quarter during the last several quarters. Estimates of the amount of copper-base scrap (copper content) available to foundries during the first half of this year are for an increase of about 10 per cent over the corresponding 1955 period. Supply of refined copper is expected to be in approximate balance with demand by midyear. Consequently, the supply outlook for all segments of the copper industry, including nonferrous foundries, should continue to be good, Mr. Meissner stated. Possibility of lower prices exists, he said, although not reductions to the 1954 level.

The Aluminum & Magnesium Division of BDSA seeks the advice and criticism of industry, it was stated by John H. Styer, chief, Products and Facilities Branch. Pointing to the rapid increase in aluminum consumption the last few years, he said that various sources forecast a further increase of 50 per cent the next five years. Total estimated supply of aluminum by 1960 is placed at 3,300,000 tons.

Mr. Styer reported that recent meetings of aluminum primary producers, smelters and prime products interests resulted in recommendations that the government make no stockpile call for aluminum in the second half of 1956, and that the export quota for aluminum scrap for any one month be not more than 500 tons, or 1500 tons per quarter.

Discuss Comparative Cost Groups

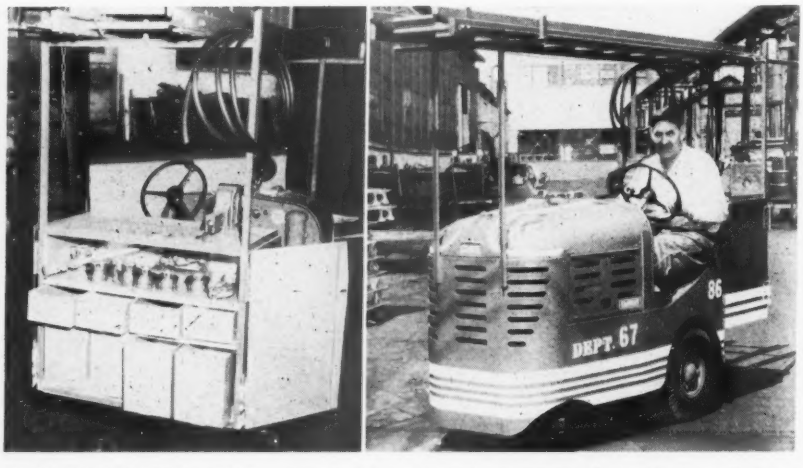
The meeting was concluded with a general discussion of comparative cost groups. William A. Gluntz, presiding, outlined some of the advantages to both foundries and customers and pointed out the insurance that an adequate costing procedure would afford in the event price controls should be established again.

John Carter, cost consultant for the Gray Iron Founders' Society, related the beneficial experience of that organization in conducting such groups for a number of years. The plan, he said, improves a foundry's efficiency by showing if its costs are high or low in relation to those of other foundries. Its principal recommendation, he added, is that it induces foundries to install a sound cost system.

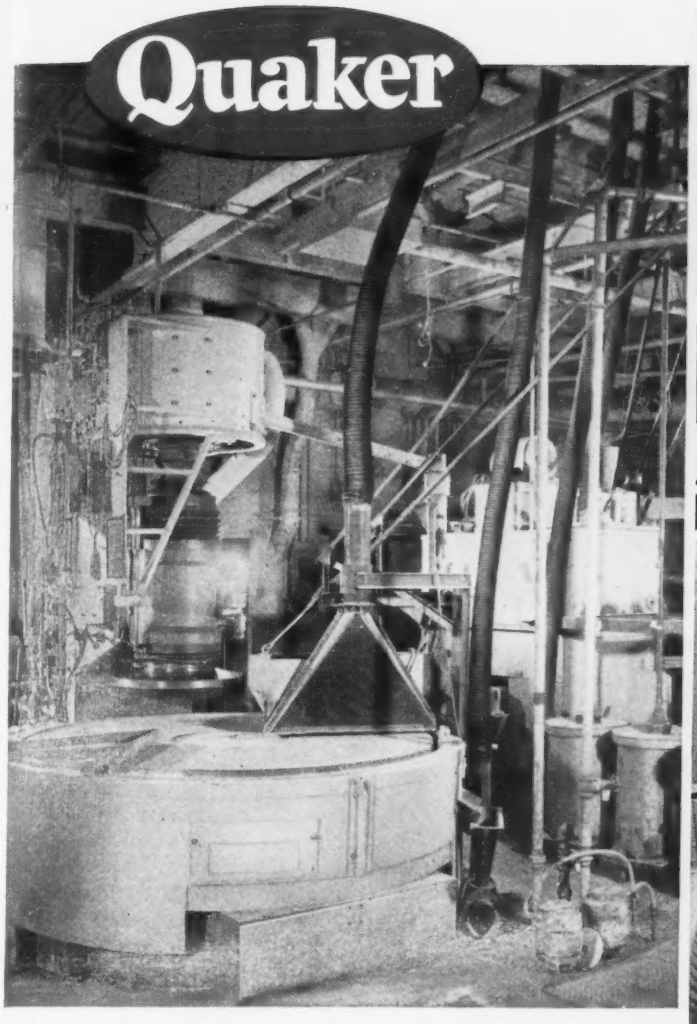
The annual dinner meeting of the society in the evening drew a record attendance of 320. Watson B. Wilkins, American Manganese Bronze Co., Philadelphia, was master of ceremonies.

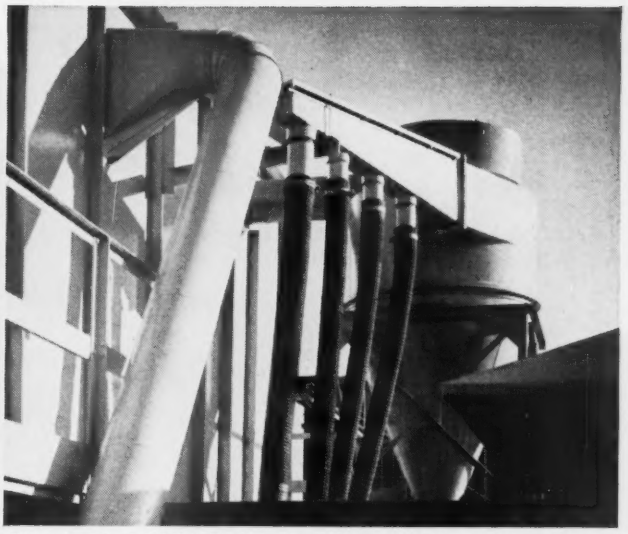
Five blown-up pictures from the early life of retiring president William L. Leopold were unveiled to the delight of his fellow foundrymen, and past president H. A. White then presented him the president's plaque.

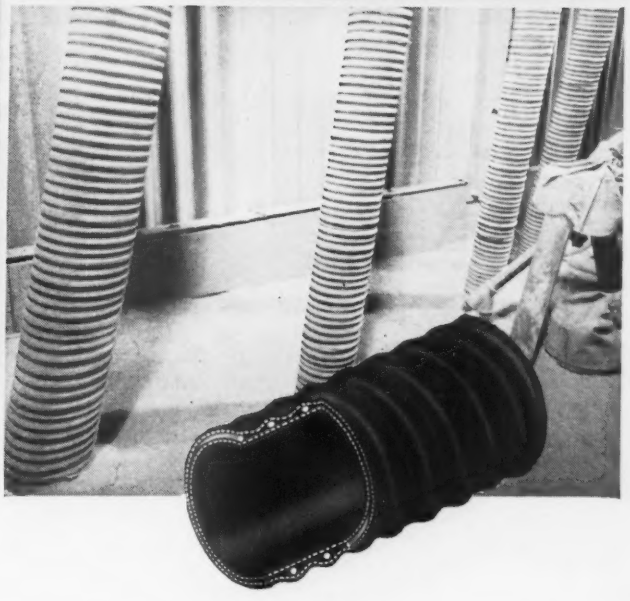
Wililam A. Meissner Jr. presented James W. Wolfe, secretary of the society, with an engraved silver tray as a token of esteem from his Washington friends. Mr. Meissner pointed out that Jim's friends in Washington admire and appreciate his zealous and sincere efforts and his unselfish devotion to the society.



TRAVELING TOOL BOX: Devised by the maintenance department of Continental Motors Corp., this traveling tool box speeds up repair work and cuts downtime on production machinery. Racks, cupboards and drawers on a gas-powered Clarkat towing tractor hold practically every tool likely to be used on repair jobs. A simple frame welded to the tractor body holds ladders, extra pipes and other long items. The unit is said to have eliminated two-thirds of the travel involved in getting tools to a repair job by getting men and equipment to the spot in just one trip







Quaker Exhaust hose at Simonds Abrasive Company, Philadelphia, Pa.

This exhaust hose already 4 times longer lasting in this grinding wheel plant...

Your Quaker-Quaker Pioneer distributor can supply not only your standard needs —but also your highly specialized ones. You'll find him a prompt dependable money-saving source for everything you need in rubber products. Write for free brochure and name of your nearest distributor.

Continuous handling of abrasive dust and steel shot calls for an exhaust hose of proven stamina. This Quaker hose has it. Even after 6 months of steady use by this grinding wheel manufacturer, it is still standing up to the wearing effects of abrasive particles—as compared to 6 weeks service by previously-used hose. It is specifically made for such tough service. Tube is specially compounded abrasive-resistant stock. Extra strength is provided by two plies of sturdy fabric and a helix of flat steel wire. Cover resists aging and is corrugated to give ready flexibility for bending around sharp corners. In lengths up to 50 feet. For lasting service specify Quaker-Quaker Pioneer exhaust hose.

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H. K. PORTER COMPANY, INC.

QUAKER RUBBER DIVISION
Philadelphia 24, Pa.

QUAKER PIONEER RUBBER DIVISION
San Francisco 7, California

Portable thermocouple and indicator are used to take temperature of a 10,000-lb heat of stainless steel

Checking and Recording

METAL TEMPERATURES

By ROY FINK
Metallurgist
Electric Steel Foundry Co.
Portland, Oreg.

ONE of the most critical problems facing foundrymen over the years has been pouring temperature of the metal. In steel, slight variations from the ideal temperature often result in an altered grain structure which no amount of heat treating can erase completely.

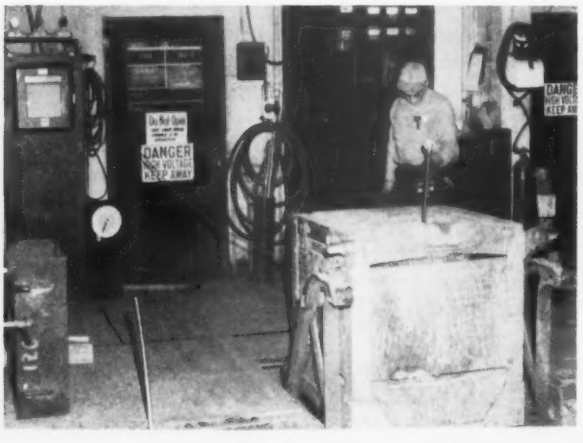
The obvious solution rested on the development of some sort of instrument to measure metal temperatures before pouring. This was partially achieved by the invention of the optical pyrometer, an instrument that tells metal temperature with reasonable accuracy by use of matching colors.

The optical pyrometer was not enough, however, in steel foundries where castings are carefully engineered and metallurgically controlled for their various industrial applications.

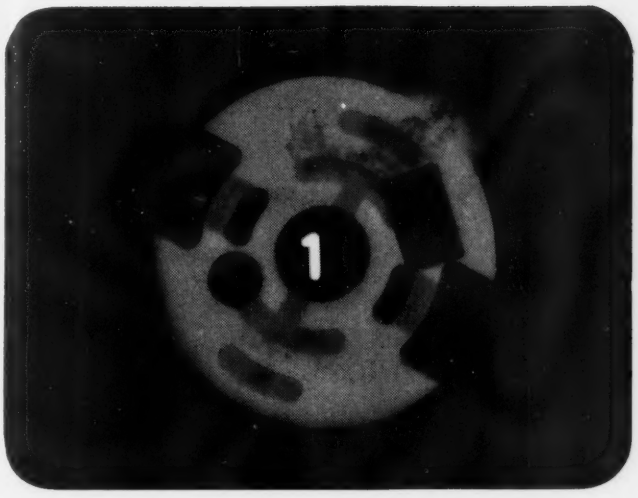
The answer to the problem of controlled pouring temperature was the immersion thermocouple, a device that can be actually immersed in the liquid metal and take the temperature much in the same manner as a thermometer. The part that comes in contact with the metal consists of two dissimilar platinum alloy wires welded together and protected by a shield of fused quartz. This is connected to instruments which indicate the temperature immediately and at the same time make a permanent record for future reference.

Immersion thermocouples with remotely controlled recording equipment are a boon to such foundries as ours, which produces more than 80 different alloys, melts by both induction and direct arc processes, and pours into molds made by three different methods—static, shell and centrifugal. ESCO has a Leeds & Northrup portable molten metal thermocouple, used with a recorder in the centrifugal foundry, and an indicator which has been made portable so that it can be used wherever necessary. The recorder is mounted on the induction platform in one of the shops where centrifugal castings as well as static castings are produced, and where the steel is melted by both induction and direct-arc facilities. Outlets have been provided at four different locations in the shop for the portable thermocouple, and compensating lead wires connect these out-

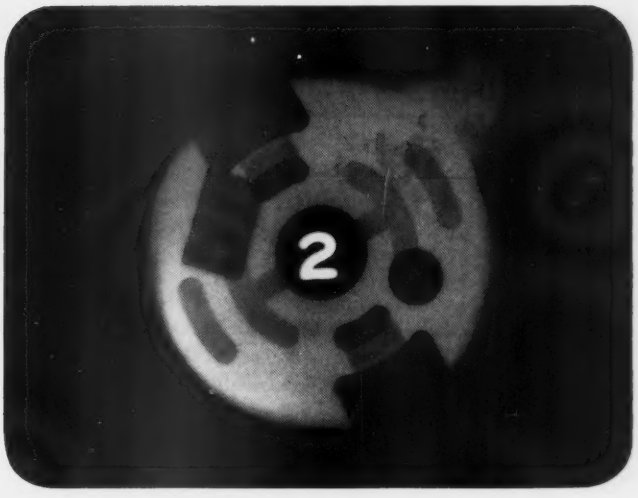
Portable thermocouple records temperature of heat in induction furnace just before it is tapped. In the background are the recorder and the indicator



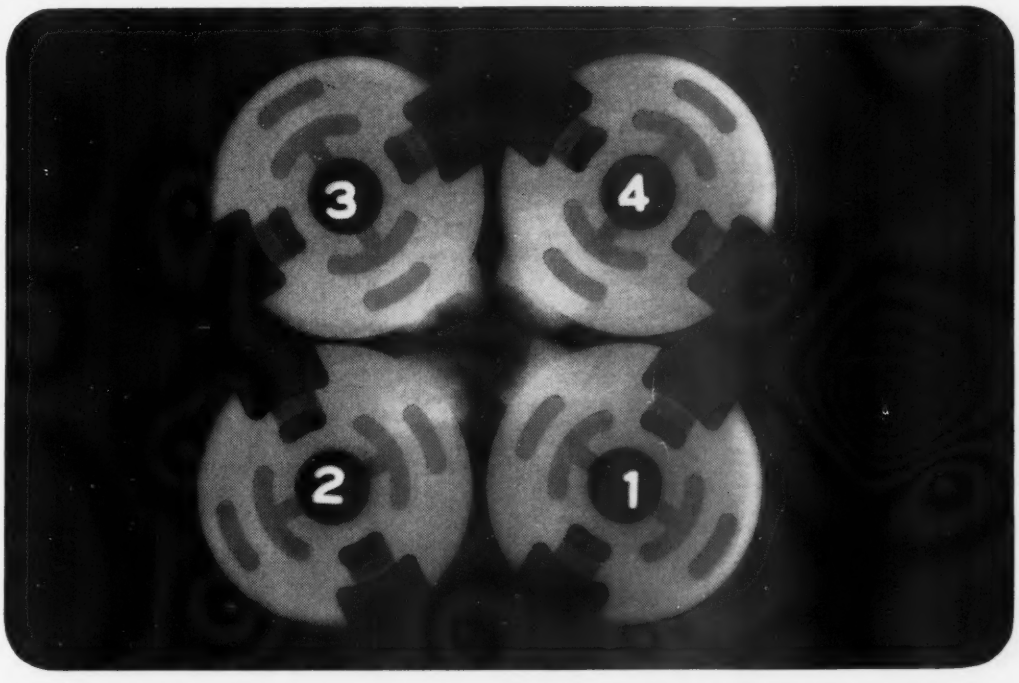
Thermocouple is used to record the temperature of the metal in a small crane ladle just before it is poured into the centrifugal mold shown at the right



1. Radiography revealed considerable internal shrinkage with original casting technics—suggested a change in gating.



2. Radiography, after a change in the "in gate," showed that there was definite progress in eliminating shrink.



3. Radiography shows the final technic, with the "in gate" further increased in size and a minor redesign to improve progressive solidification, produces a satisfactory casting.

Radiographs courtesy of New York Air Brake Company.

Radiography shows how to correct Shrink

More and more cases like this occur every day. So it's easy to see why progressive suppliers of quality castings make continually greater use of radiography. It points the way to sound production quickly—gives assurance that only high-quality work is delivered.

If you would like to take advantage of radiography in your operations, talk it over with your x-ray dealer. Or write to us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY, X-ray Division, Rochester 4, N.Y.

Radiography . . .

another important example of Photography at Work.

Kodak

TRADE MARK

The HUB of Alloy Steel Production is the home of OHIO FERRO-ALLOYS

We think it might be an item of interest to all our customers to know that Ohio Ferro-Alloys Corporation was conceived almost a third of a century ago in the minds of men who were busy making Canton, Ohio the world's largest producer of fine alloy steels.

Out of their success came the capital which launched our corporation. But more important than all came the precious "on the scene, day by day experience" which now enables us to chart our course with confidence.

Here in the heart of alloy steel making America we quickly feel the changing pulse of the industry, feel the first impact of new developments

We gladly share with you, all our ferro-alloy customers, the advantages we enjoy in living next door to the world's greatest alloy steel laboratory . . . the laboratory of practical experience.

In addition to our headquarters at Canton, we have plants located for your convenience at Philo, Ohio; Brilliant, Ohio and Tacoma, Washington.

Thermocouple and indicator are used to check temperature of spoon sample taken directly from the arc furnace

lets with the recorder.

Since the recorder is permanently installed and the outlets are located in various parts of the foundry, some sort of signaling system was needed to indicate when proper pouring temperatures had been reached at various positions on the floor. The solution was use of an indicator connected in parallel with the recorder. Use of the two instruments enables us to take direct temperature of the metal in the induction furnace and, by means of a spoon sample, from the direct arc furnace. Thus, we are able to have a record of metal temperature before it is tapped, and by use of the recorder and the portable indicator connected to it, a permanent record can be kept.

The indicator has been installed on a cart so that it can be used on three other pouring floors which receive metal from two other sets of direct-arc furnaces. There it is used directly with the portable metal thermocouple.

Even at locations such as shank floors, where use of the immersion thermocouple and recording equipment is impractical because several pours are made from each ladle and use of the equipment would delay pouring, the immersion thermocouple proves very advantageous. ESCO uses a potentiometer type optical pyrometer on the shank floor and standardizes it against the immersion thermocouple so that a true temperature of the metal can be obtained. A disadvantage is that the recorder cannot be used to give a permanent record of these pouring temperatures. However, the combination of instruments does provide a means of very close control of temperatures at which all classes of castings are poured.

We Invite You to try "SUPERFLAKE"* FOUNDRY PRODUCTS

CHECK HERE

	"MOLDUKO"* CORE & MOLD WASH Produces smooth castings—Stops "burning in"—Airdries Will ship **10 Gals. of Molduko & 25 lbs. of Filler** at full drum prices for test purposes.
	HYDRO GRAPHITE *(It's New!)* Excellent permanent mold wash.
	"CARBON-RAISER"* (Add to the metal in the ladle, at the spout, in the furnace or in the cold charge) **IRON FOUNDRIES** use to control depth of chill and improve the machineability of the castings. **STEEL FOUNDRIES** use to control carbon content, in the ladle and in the furnace quickly, accurately and efficiently.
	PARTING (DRY or LIQUID) Non Silica or Tripoli, Highest Quality
	PIPE REDUCER Used on "Gates" and "Risers" in Steel & Iron foundries.
	PLUMBAGO & CORE WASHES In both Dry and Paste forms.
	LADLE WASH
	MUDDING COMPOUNDS
	CORE PASTES Strong bond, Dry quickly.

SUPERFLAKE GRAPHITE PRODUCTS

SUPERIOR GRAPHITE COMPANY

Manufacturers of mold and core washes, facings parting compounds, core paste, carbon-raiser.

TELEPHONE: RANDOLPH 6-7939

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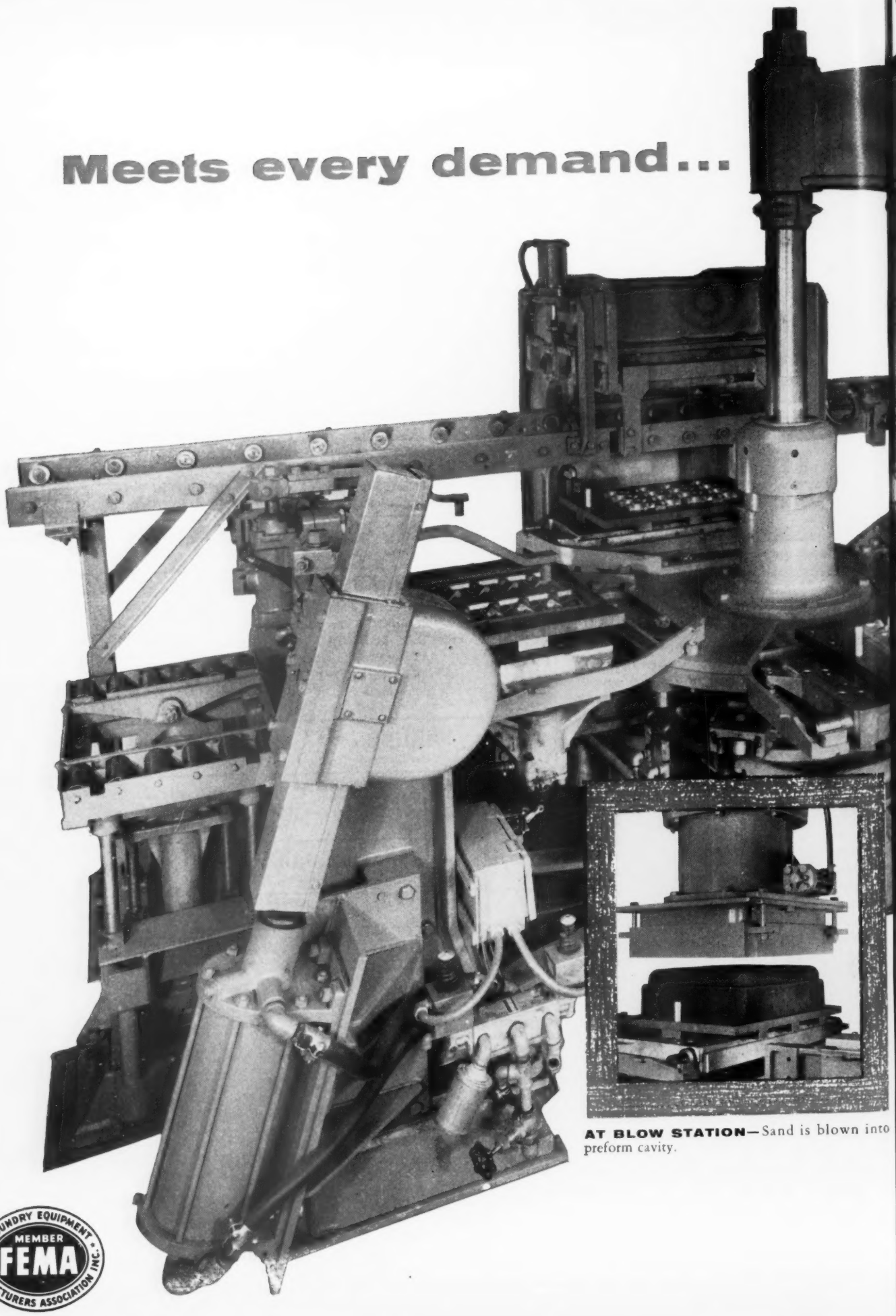


AT BLOW STATION—Sand is blown into preform cavity.

FOUNDRY EQUIPMENT MEMBER FEMA MANUFACTURERS ASSOCIATION INC.

OSBORN MOL-DEX*

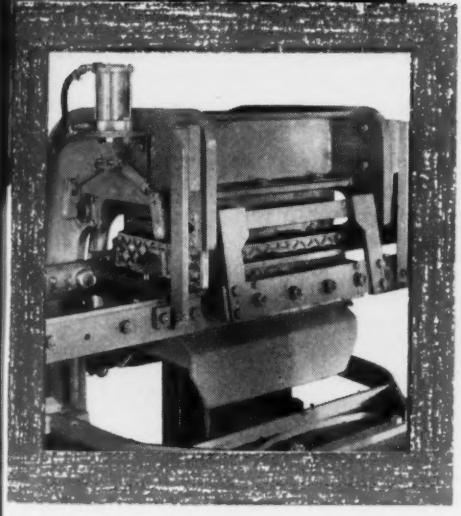
New automatic molding machine offers you unequalled flexibility... highest production... greatest dependability

Now, for the first time, even semi-production foundries can take advantage of the economies of automatic molding.

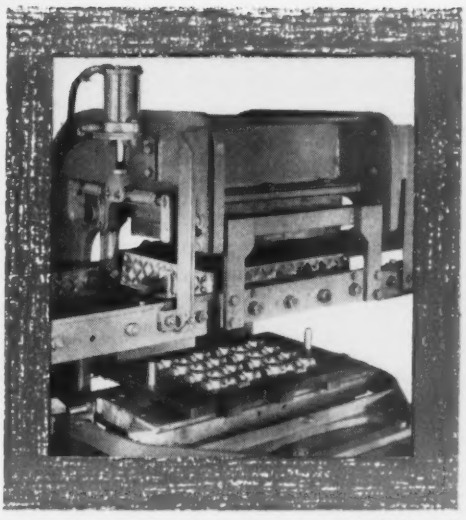
Today's most flexible molding machine, MOL-DEX is the *first* to incorporate the stripping of copes and rockover of drags in a single piece of equipment. Floating platen permits quick pattern changes.

MOL-DEX is the result of Osborn's advanced engineering, precision manufacture and knowledge of applications . . . your three guarantees of dependability. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

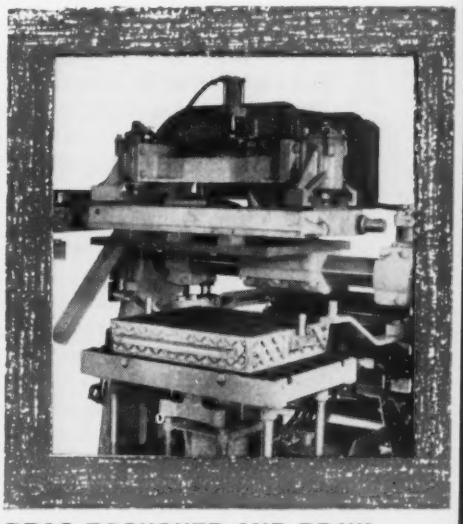
*Trade-Mark



FLASK LOAD AND SQUEEZE STATION—Preform raised and squeezed into flask.



COPE STRIP—Roller bars engage flask rails for accurate stripping.



DRAG ROCKOVER AND DRAW—Drags indexed to third station for drawing.

Leader in automation for the foundry

OSBORN

Core Blowers Molding Machines
Industrial Brushes

For more information, use Reader Service Card, page 229

PROGRAM

Tuesday, June 5

9 a.m.—**Relationship of Plant Layout to Material Handling,** James Apple, Michigan State University

Traffic Management and Material Handling, E. Albert Ovens, vice president, Academy of Advanced Traffic

10:45 a.m.—**Work Simplification and Its Use in Material Handling,** Alan H. Mogenson, Work Simplification Conferences

Top Management and Material Handling, George Raymond Jr., president, The Material Handling Institute

Wednesday, June 6

9 a.m.—**Analyzing Material Handling Costs,** Fred V. Gardner, Fred V. Gardner Associates

A Simplified Approach to Stock Positioning and Space Control, Andrew J. Briggs, head, Material Handling and Warehousing Branch, Department of the Navy, Bureau of Supplies and Accounts

10:45 a.m.—**Operation Analysis in Material Handling,** Grover Barkdoll, Methods Engineering Council

Distribution in Relationship to Material Handling, Wilbur D. Warner, material handling manager, Sears, Roebuck & Co.

Thursday, June 7

9 a.m.—**Paper Mill Management Looks at Material Handling,** Joseph W. Shimp, Marinette Paper Co.

Managerial Problems Arising Out of Automation, James R. Bright, Harvard University

10:45 a.m.—**Work Measurement and Material Handling,** H. B. Maynard, president, Methods Engineering Council

Management Responsibilities in Education and Training, Lillian Gilbreth, Knapp Visiting Professor, Purdue University.

GEORGE G. RAYMOND JR.
President, MHI

MHI and AMHS Sponsor

MATERIAL HANDLING

Show and Discussion

ABOUT 1200 new developments and new pieces of material handling equipment will be shown to an estimated 15,000 to 20,000 visitors to the Material Handling Institute's Exposition of 1956 at Public Auditorium, Cleveland, June 5-8.

R. L. Fairbank, general sales manager, Towmotor Corp., Cleveland, and chairman of the MHI exposition committee, said that 160 exhibitors will be showing new equipment, new ideas, new developments and new handling techniques created to save industry thousands of dollars in the years to come.

Exhibits will be open June 5 and 6 from 10 a.m. to 5:30 p.m.; June 7 from 12 noon to 10 p.m., and June 8 from 10 a.m. to 5 p.m.

In addition to the exposition, a technical meeting sponsored by the American Material Handling Society will be held during the mornings of June 5, 6 and 7 in meeting rooms of the Auditorium. Twelve technical sessions comprising the meeting will follow the theme "Integrated Handling—Management Profit Tool."

Top management specialists will discuss management aspects of integrated handling for increasing production and decreasing costs. Included in the program are sessions on work measurement, space control, plant layout, cost analysis, automation, work simplification, distribution, traffic management and training programs and their relationship to material handling.

Registration cost for the technical sessions is $10 for one day and $25 for three days for AMHS members; for nonmembers it is $12 and $30, respectively.

George Smith is chairman of the AMHS technical sessions general committee.

An innovation at this year's exposition and technical meeting is the first national American Material Handling Society dinner, to be held at the Cleveland Hotel, June 6, at 6:30 p.m. John R. Bright, chief planning engineer, John Lucas Ltd., Birmingham, England, and past chairman of the Institute of Material Handling of England, will be the featured speaker. In addition, national AMHS officers will be installed and national awards presented.

Reprints Available

FOUNDRY recently published an "Inventory of Foundry Materials Handling Equipment" which has been reprinted in pamphlet form. Several years ago a series of articles dealing with material handling in all phases of foundry operation were published. These, too, have been assembled into a reprint entitled "Material Handling Problems." Copies of both are available from FOUNDRY, Penton Building, Cleveland 13.

An estimated 15,000 to 20,000 visitors will attend the Material Handling Institute's Exposition of 1956 at Public Auditorium, Cleveland, June 5-8

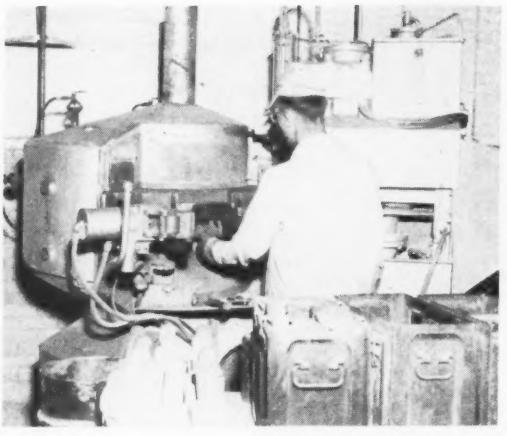
EXHIBITORS

COMPANY	BOOTH NO.
Acme Pallet Co.	710
Acme Steel Co., Acme Steel Products Div.	1610
Acme Steel Co., Dexion Div.	1628
Albion Industries Inc.	1339
Algene Marking Equipment Co.	227
Allen Industrial Products Inc.	1337
Allied Mfg. & Sales Co., Div. Grand Specialties Co.	1402
Allis-Chalmers Co., Buda Div.	1612
Alvey-Ferguson Co.	1132
American Chain & Cable Co.	A1001
American Machinist	1316
American MonoRail Co.	1419
American Pulley Co.	1027
Anchor Coupling Co.	207
Anchor Steel & Conveyor Co.	A1008
Artco Corp.	A1014
Austin-Western Works, Construction Equipment Div., Baldwin-Lima-Hamilton Corp.	1405
Automatic Transportation Co.	1234, 1332
Automation	415
Baker-Raulang Co.	908, 1432
Ballymore Co.	501
Barrett-Cravens Co.	A1009
Bassick Co.	505
Belt Corp.	A1002
Benton Harbor Engineering Works Inc.	A1017
Berg-Gibson Mfg. Co.	1030
Better Packages Inc.	310
Bond Foundry & Machine Co.	124
Brainard Steel Div., Sharon Steel Corp.	A1029
Broderick & Bascom Rope Co.	703
E. W. Buschman Co.	113
C & D Batteries Inc.	1444
C. I. T. Corp.	507
Cascade Mfg. Co.	1326
Chain Belt Co.	410
Chainveyor Corp.	322
Chester Hoist Div., Nat'l Screw & Mfg. Co.	A1016
Chicago Tramrail Corp.	1411
Chilton Co.	219
Chisholm Moore Hoist Div., Columbus McKinnon Chain Corp.	302
Clark Equipment Co., Construction Machinery Div.	1436
Clark Equipment Co., Industrial Truck Div.	1426
Clark Equipment Co., Ross Carrier Div.	1416
Cleveland Tramrail Div., Cleveland Crane & Engineering Co.	216
Coffing Hoist Div., Duff-Norton Co.	109
Coles Cranes Inc.	1630
Colson Equipment & Supply Co.	128
Colson Corp.	1021
Conover-Mast Publications Inc.	611
Crescent Metal Products Inc.	117
Dempster Brothers Inc.	909
Doerr Electric Corp.	1435
Thomas A. Edison Inc., Storage Battery Div.	901
Electric Products Co.	1427
Electronics and Instrumentation Div., Baldwin-Lima-Hamilton Corp.	1405
Elwell-Parker Electric Co.	1020
Equipment Mfg. Co.	A1013
Euclid Crane & Hoist Co.	208
Exide Industrial Div., Electric Storage Battery Co.	414
Fab-Weld Corp.	1136
Factory Management and Maintenance	426
Fairbanks Co.	116
Faultless Caster Corp.	509
Harry J. Ferguson Co.	A1020
Field Engineering Co.	105
Flow	119, 1104
FOUNDRY	415
Gar Wood Industries Inc.	906
General Box Co.	215
General Electric Co., Apparatus Sales Div.	1032
General Electric Co., Electronics Div.	205
Gerlinger Carrier Co.	1406
Globe Hoist Co.	1106
Gould-National Batteries Inc.	1425
Grand Specialties Co.	1402
J. W. Greer Co.	318
Harnischfeger Corp.	1502
Hapman Conveyors Inc., Div. of Hapman-Dutton Co.	A1006
Hercules Motor Corp.	510
Hertner Electric Co.	120
Hughes-Keenan Corp.	121
Hyster Co.	1116, 1422
Industrial Equipment News	106
Ingersoll Kalamazoo Div., Borg-Warner Corp.	1312
Ironbound Box & Lumber Co.	407
Island Equipment Corp.	1403
Kalamazoo Div., New York Air Brake Co.	1126
Kalamazoo Mfg. Co.	1034
K. W. Battery Co.	A1015
Kelley Co. Inc.	512
Knickerbocker Co.	904
Koehring—Kwik-Mix Co.	1429
Lamson-Mobilift Corp.	1028
Landahl Conveyor Co., Subsidiary of American MonoRail Co.	1419
G. B. Lewis Co.	422
Lewis-Shepard Products Inc.	228, 1012
Liftequip Co.	401
Lift Trucks Inc.	702
Louden Machinery Co.	1015
Loomis Machine Co.	806
Machine Design	415
Magline Inc.	101
Magnesium Co. of America	1218, 1335
Mansaver Industries	411
Market Forge Co.	A1019
May-Fran Engineering Inc.	807
Mechanical Handling Systems Inc.	1015
Mercury Mfg. Co.	1003
Modern Caster Co.	204
Modern Materials Handling	320, 609
Morse Chain Co.	1201
Motor Generator Corp.	1130
Moto-Truc Co.	416, 417
New Equipment Digest	415
Nutting Truck & Caster Co.	513
Ohio Galvanizing & Mfg. Co.	217
Ohio Hoist & Mfg. Co.	312
Ohio Honing & Hydraulic Co.	A1012
Orangeville Mfg. Co.	A1021
Oster Mfg. Co.	1608
Parker Appliance Co.	1102
Pittsburgh Steel Products Co.	500
Plant Engineering	1202
Powell Pressed Steel Co.	504
Power-Line Sales Inc.	714
Rack Engineering Co.	808
Radio Corp. of America	125
Rapids-Standard Co.	802
Raymond Corp.	1122, 1228
Ready-Power Co.	1409
Republic Steel Corp.	900
Revolvator Co.	303
Richards-Wilcox Mfg. Co.	402
Robbins & Myers Inc.	1417
David Round & Son Inc.	403
Rowe Methods Inc.	301
Ruger Equipment Inc.	108
Sage Equipment Co.	1240
Saginaw Products Corp.	A1025
Service Recorder Co.	225
Service Supply Corp.	1036
Shepard Niles Crane & Hoist Corp.	102
Silent Hoist & Crane Co.	326
Spaulding Fibre Co.	1328
Stackbin Corp.	202
Stanley Works	1011
Steel	415
Stephens-Adamson Mfg. Co.	316
Sterling Bolt Co.	701
G. H. Tennant Co.	705
Thomas' Register	106
Thomas Truck & Caster Co.	907
Tote Systems Inc.	1330
Towmotor Corp.	1112, 1206, 1301
Union Metal Mfg. Co.	608
Union Steel Products Co.	1317
Unistrut Products Co.	304
Vickers Inc.	1415
Waukesha Motor Co.	801
Jervis B. Webb Co.	110
Weber Marking Systems, Div., Weber Addressing Machine Co.	708
West Bend Equipment Corp.	210
Whiting Corp.	1029
Yale & Towne Mfg. Co.	1004, 1212

PATTERNS and COREBOXES

for Shell Mold Castings

By HARRY WEAVER
Director of Manufacturing
Brillion Iron Works Inc.
Brillion, Wis.



Shell cores are blown on six-station, semi-automatic unit. Sand mix is forced from the magazine to the heated box with air pressure

PRIMARY consideration must be given in shell molding to the design of pattern and corebox equipment, if production difficulties are to be avoided. We use industrial engineering department personnel to design this equipment because of their closeness to the shop and its problems.

Detailed drawings are made of the pattern plates and inserts as well as of the mounting and layout of these insert plates. Draft is always indicated, and shrinkage is added so that the patternmaker or tool and diemaker works to exact dimensions, as given on the prints. This procedure takes time, but it pays off. Once the equipment has been made, changes are very difficult, and mistakes cannot be soldered up or otherwise corrected easily.

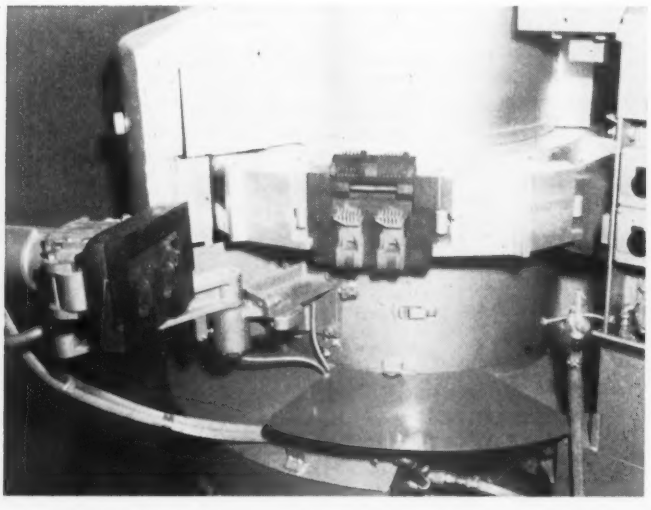
Another factor which must be considered is that the equipment has to be designed to operate at temperatures up to 500° F. Actually, it should be able to stand somewhat higher temperatures, for a safety factor is essential.

The production molding machine now used at Brillion is constructed with an electrically heated oven in which the pattern and stripper plate are set. This construction eliminates the originally expensive practice of building heating elements into every pattern. It does, however, present a slight problem: The stripper plate normally is hotter than the pattern itself. We are experimenting with a heat-resistant, stainless-steel stripper plate built permanently into one of the machines to combat this concentrated heat.

Hydraulic valve pattern assembly with drag insert and drag stripping pin assembly removed from it

The most satisfactory pattern material we have used to date is a standard gray iron alloyed with chrome and nickel. Pattern castings must be dense and close grained, without defects on the finished surface. The mold itself is hard and unyielding, and a hole or porous area in a vertical wall would start drag marks. The sand grains would flow into the defect, harden in place and then, when the mold was stripped, they would either break off or cut through the mold, scoring the surface. If surface defects occur, they can be brazed shut and filed and

This paper was presented at the Wisconsin Regional Foundry Conference, Milwaukee, Feb. 9-10, 1956.



Fin corebox is shown on machine, before its removal. Note drawn outer half and loose piece

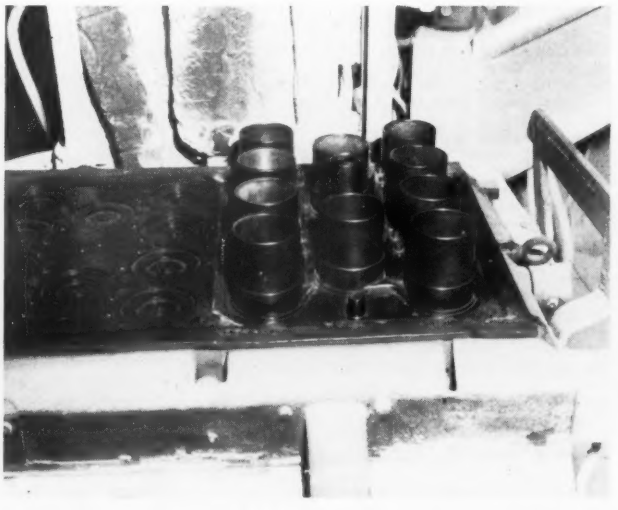


Illustration shows the patterns for cylindrical castings as they are mounted in molding machine

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HY-TEN makes cores better . . . betters foundry production and profits, because HY-TEN gives you the benefits of the newest and best surface active agents, drying agents, synthetic polymers and resins.

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HY-TEN gives a thorough bake-through in fast or slow bakes, at low temperatures or high. Heavy core sections always bake out completely. Thin sections don't overbake or burn out.

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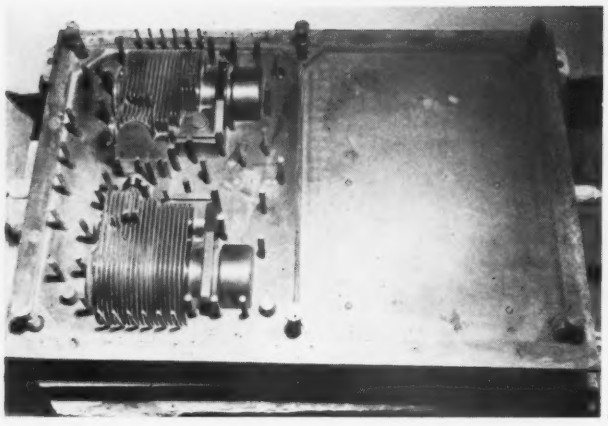
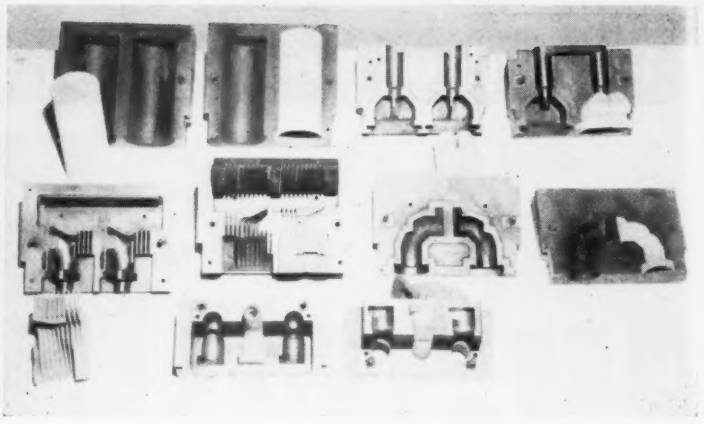




Left—Air-cooled cylinder patterns mounted on half of pattern plate; the stripping pins have been extended. *Right*—Corebox equipment for pattern

polished to the proper dimension. The pattern then will perform entirely satisfactorily. The pattern surface must be polished, and all backdraft must, of course, be eliminated.

Aluminum also is used for the process, but it moves considerably at higher temperatures. Softer than iron, it is more subject to damage from mishandling and generally is more open-grained. This quality aggravates scoring or wear.

Brass or bronze patterns mounted on heavy plates may in some instances be better than iron because of their more rapid heat transfer. They should, however, be of a hardness equalling that of iron to stand up under normal abuse. Small brass patterns have been used and have worked well. They polished up nicely and gave no mold or core removal problems.

Chrome plating of the pattern surface has been tried and has given reasonably good results. Our experience with such plating has been too brief to prove definitely the permanence of this procedure, but it looks very encouraging, especially where pattern buildup is required.

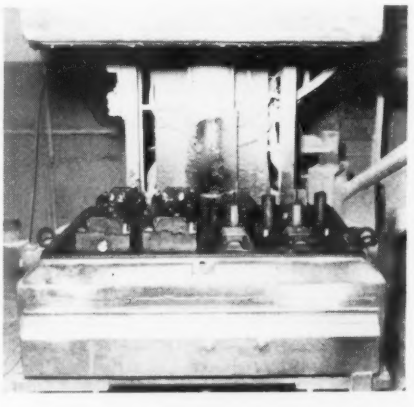
Making the Pattern—Now let us turn to the actual construction of the shell mold pattern. Pattern costs are relatively high, and the importance of using a reputable pattern or tool and die shop cannot be stressed too highly. Mistakes are very difficult to correct.

The basic part of the pattern is the pattern plate. We originally attempted to keep it at a uniform thickness of about ¾-in. That procedure since has been proved to be a mistake. A basic pattern plate 1½ or 2 in. thick maintains uniform temperatures throughout the entire plate area, whereas the thinner plates gave hot and cold spots that resulted in trouble.

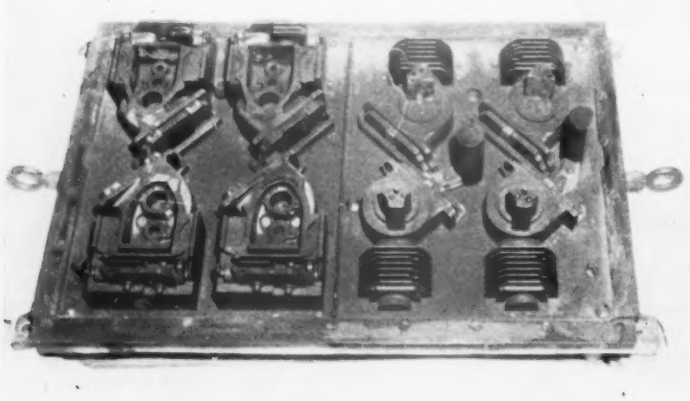
Pattern inserts are mounted on the heavy plate. These inserts are not hollowed out; they are made of solid material so that they conduct heat from the pattern plate and, because of their own mass, act as heat reservoirs.

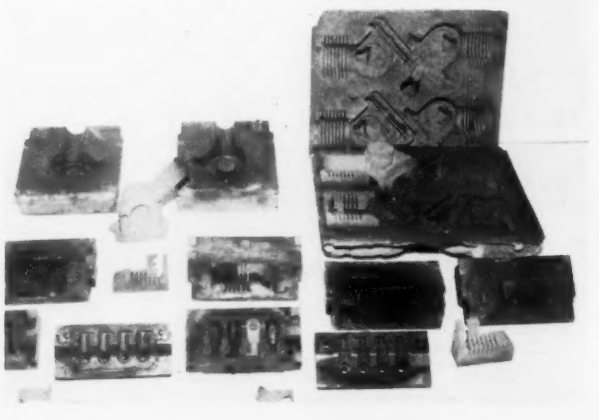
Our most recent design has involved cope and drag insert plates set into a pattern frame in the molding machine. These insert plates are used to simplify handling and to reduce the initial cost of the pattern equipment to the customer. Whether it is of the insert or the solid type, the pattern plate is rough machined, stress relieved, finish machined and ground on the pattern side.

Patterns to be mounted on this plate are made in several ways. If the pattern is easily machined, a block of iron is furnished to the patternmaker, and he rough machines the part, stress relieves it and finish machines it for mounting on the plate. As mentioned before, the surface must be well polished to facili-



Left, below—Air-cooled cylinder pattern. *Right*—Same pattern mounted in molding machine. *Right, below*—Coreboxes, cores and molds for part





High Frequency Furnaces. Norton MAGNORITE cement is engineered to provide maximum heats per lining. It gives extra long service life at temperatures to 3250°F, its high-rammed density resists metal penetration, erosion and chemical attack, and it is free from shrinkage cracks.

Low Frequency Furnaces. Foundries melting nonferrous metals and malleable iron report longer life from linings of Norton ALUNDUM cement. This high-melting, long-lasting cement is also prescribed for use in holding ladles and desulphurizing ladles.

ON TIME!
...with melt after melt

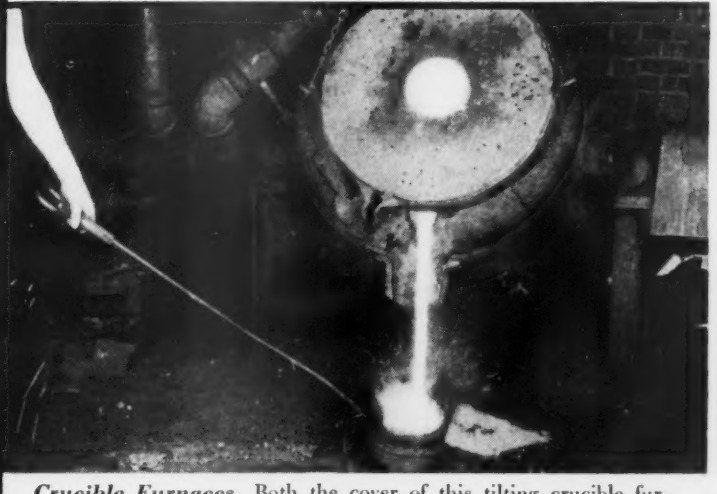
Norton Refractory ℞'s help maintain hot metal schedules, reduce shut-downs, in your furnaces

Cupola Furnaces. For back slagging cupolas the Norton ℞ is CRYSTOLON slag hole blocks. For capping the notch and lining the slag chute in front slagging cupolas, use CRYSTOLON bricks and cement. CRYSTOLON material is extremely resistant to attack by cupola slags thus providing needed protection in these critical areas.

Norton ALUNDUM*, CRYSTOLON*, MAGNORITE* and FUSED STABILIZED ZIRCONIA refractory materials are *engineered* for longer, lower cost service — and *prescribed* for better processing in many foundry applications.

For ℞'s that will improve your own processing call in your Norton Refractories Engineer. Or write to NORTON COMPANY, Refractories Division, 305 New Bond Street, Worcester 6, Mass. *In Canada:* A. P. Green Fire Brick Co., Ltd., Toronto 5, Ontario.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



Crucible Furnaces. Both the cover of this tilting crucible furnace and its cement lining are made of CRYSTOLON refractory material, engineered for the user's particular needs. CRYSTOLON linings offer effective protection against flame erosion and thermal shock in many different furnace applications.

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tate and improve its operation.

Pattern designs of a more complicated nature may require the use of a duplicator or of a precision casting to be mounted on the plate.

When multiple patterns are to be mounted, it is feasible economically to make a master pattern out of brass or aluminum, mount this pattern on an experimental dump-box plate and produce shell-molded pattern castings. They can be used for the production pattern after a minor cleanup operation. Irregular sections of the pattern can be cleaned up if approximately 0.005-in. finish is left. Sections of the pattern that may be machined may have 1/32 or 1/16-in. finish left to be machined off to the correct dimension.

Stripping Pin Design Is Critical

Stripping pin design also has been found to be critical. We have standardized on a commercially available pin used primarily in the plastic molding industry. Most of these pins are mounted flush with the plate, and every effort is made to keep them outside the pattern surface. Ordinarily, six-headed pins actually are built into the pattern frame and are used to position the stripper plate so that all other stripping pins stay flush with the surface of the pattern.

A head at the lower extremity of the flush-mounted stripping pins is mounted against the stripping plate and held in place by steel hold-down plates ½-in. thick. Considerable clearance is given these pins in the hold-down plates as well as in the pattern plates to allow for expansion of the pattern and stripping plate at operating temperatures.

Spring-operated stripping pins were tried first. These have been eliminated in more recent designs because the operating temperatures did not give good spring life. In addition, a positive air-operated stripping plate with air pressure on the retracted as well as extended position gave much better service. Use of the air-operated stripping plate and elimination of the springs also has made it possible to increase stripping movement to 3 in. This change has been particularly important on high jobs.

Consideration must be given to the location of the patterns on the plate to allow for gating, stripper pins and locators and also to allow for sufficient area to paste the halves of the mold together satisfactorily. Core prints must be kept sufficiently far enough away from the gating, especially when hollow cores are used, to prevent metal from running inside the cores. Mold half locators

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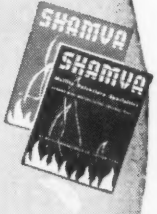

THE MULLITE REFRACTORIES CO.
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must be designed into the equipment unless the core prints can serve the same purpose.

In several jobs in which locators are built into the surface, it was necessary to provide closing guides to act as flask pins. These closing guides prevent the operator from scuffing the halves of the mold together and also prevent him from accidentally brushing pasting resin into the casting cavity.

Machine Type Important—Corebox design naturally depends on the machine used to produce the cores as well as on the individual design of the core required. Our production coreblowers are six-station, bottom-blow, rotary indexing machines equipped to handle vertically split boxes.

Cores are blown automatically by forcing the sand mix from the magazine up into the heated box with air pressure. Pressure is maintained for a required investment time, after which it is released, and the magazine and the blow plate retract. This action leaves the bottom of the box open to allow any sand not affected by the heat to flow out of the box, producing a true shell core. Drained sand is returned to the sand hopper for reuse.

The invested corebox is indexed into a gas-fired oven for curing, and another box is blown. After curing, the box is indexed to the core removal station. Here the operator swings the drawing mechanism into place and draws off the outer half of the corebox. This half is swung out to a cleaning position, and the core is removed manually from the other half. After core removal, the box is blown clean, sprayed if necessary, closed and indexed to the blow position for investing.

Corebox design follows basically the same principle set up for patterns. The use of heavy alloyed iron boxes to maintain uniformity of heat is continued, and of course the core surfaces must be smooth and well polished.

Boxes will, of necessity, occasionally have to be designed with irregular parting surfaces. No difficulty will be experienced with this design provided that boxes are well constructed and that all joints fit together properly.

Loose pieces can be designed into corebox equipment where needed. It has been our experience that because of the high operating temperatures involved, loose pieces are much easier to handle if they can be hinged or slid into place so that they need not be removed from the box itself.

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corebox venting is just as important as with dry sand practice, for good, dense cores can be obtained only with proper placement of vents. The box joint and stripper pin holes will provide some vent area which should be taken into consideration in the box design.

Most of our boxes have been built up with inserts to facilitate construction and future repair. Originally we were afraid that these pieces would work loose. To date, none of this difficulty has occurred.

The shell process provides greater latitude in casting design than conventional foundry practice. Intricate, cored holes and complicated casting sections can be maintained where dry sand cores and molds could break down. Thin-sectioned castings also are much easier to produce. Although draft angles normally are held to one-half a degree, we have produced a considerable number of castings with 0.010-in. draft on a 3 in. length. This ability can be a definite advantage in certain casting designs. The shell molds are rigid, and cores can be set by unskilled help without danger of shaving or crushing the mold surface.

These and other advantages and disadvantages of the shell process have been brought out on other occasions. It probably is not necessary to repeat them here. We feel that it is just one more casting producing process. Some castings can be made better and more economically in green sand, some in dry sand and some in shell. If by using the shell process we can satisfy our customers' demands better, we are in an improved business situation. We do not consider the shell process a cure-all or an answer to every foundry problem.

Gunite Foundries To Spend $1 Million for Expansion

A $1 million expansion program will enable Gunite Foundries Corp., Rockford, Ill., to increase its production of cast steel wheels, brake drums and wheel assemblies for the heavy-duty truck, trailer and bus market. In addition, capacity of its plant for production of commercial castings in processed gray iron and steel will be increased.

Major expenditures will be made to expand the plant's automotive division machining facilities. The company's present capacity for producing electric steel castings will be doubled by a new acid-electric furnace, additional pouring floors and the installation of more mechanized handling equipment.

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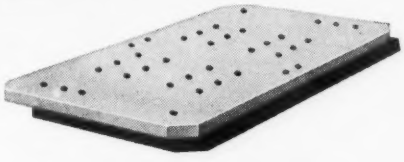

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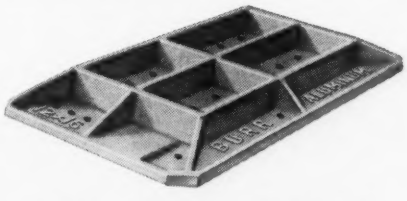

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Industrial Management Society Publishes Clinic Proceedings

Proceedings of the 19th annual time and motion study and management clinic sponsored by the Industrial Management Society in Chicago last November now are available. They include complete transcripts of talks by leaders of labor, management and government on topics which include time study, motion economy, methods, plant layout, production control, wage incentives, maintenance and human relations.

Price of the 152-page volume is $5. Write to Industrial Management Society, 35 East Wacker Drive, Chicago 1.

Book Review

Safety Management, by Rollin H. Simonds and John V. Grimaldi, 568 pages, published by Richard D. Irwin Inc., Homewood, Ill. Price, $7.80

This survey of safety management offers many new and helpful ideas. Particularly new and useful, the section on accident cost analysis fully explains the most recently developed method of estimating uninsured costs, including supporting statistical data and suggestions for using cost figures to secure management backing for safety programs.

Other areas covered include ideas for motivating safety and locating hazards, a technique for making costs work for the safety program, control of catastrophes, etc. Appendixes list common industrial hazards, their occurrence and properties and properties of selected inflammable materials.

Mr. Simonds is chairman, department of management and finance, Michigan State University, and Mr. Grimaldi is director, industrial division, and assistant manager, accident prevention department, Association of Casualty and Surety Companies.

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Industry Briefs

ALUMINUM CO. OF AMERICA, Pittsburgh, has renamed its research branch Alcoa Research Laboratories. Formerly known as Aluminum Research Laboratories, the branch was renamed because its interests have grown to include alumina and chemicals, aluminous ores, tars, pitches, lubricants, radioactive isotopes, gallium, titanium, magnesium and other metals. ARL headquarters are in New Kensington, Pa., with branches in Cleveland, East St. Louis, Ill., and Massena, N. Y.

R. H. Osbrink Mfg. Co., Los Angeles, will construct a $2½ million foundry on a 188-acre tract at Hesperia, Calif. The plant will contain 150,000 sq ft and will be of tilt-up reinforced concrete construction, designed so that it can be doubled in size as required. Initial employment will be 250, and plans call for an expansion of this number to 1000 within a year and a half.

Republic Steel Corp., Cleveland, has appointed Hallidie Machinery Co., 210 Hudson St., Seattle 4, to handle the sale and distribution of Republic material handling equipment in Washington, Oregon, Idaho and Montana. Hallidie has branch offices in Spokane and Portland.

United Stockyards Co., Chicago, has acquired an 89 per cent interest in Federal Steel Products Corp. and all shares of Zenith Steel Casting Co., both of Houston, Tex. Zenith was formed recently by Federal to produce steel castings under 600 lb. Both companies manufacture carbon steel castings used in the petroleum industry.

Harbison-Walker Refractories Co., Pittsburgh, plans to build a basic refractories plant at Hammond, Ind., for the manufacture of products to be used mainly in the construction and repair of high-temperature furnaces. The plant will have one tunnel kiln, and additional kilns will be added as needed.

Inductotherm Corp., Delanco, N. J., has appointed two new sales representatives to handle its line of induction equipment. They are Gordon Sondraker & Co., 4700 East 48th St., Los Angeles 58, and Foundry Supply Co., 1434 Howard St., San Francisco 3.

Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill., has expanded its service facilities in the Philadelphia, Buffalo and New York areas. New members of the service engineering staffs in those cities include John B. Moore and Edward W. Sullivan, Philadelphia; James T. Shelton, Buffalo; and Walter Gilmore, New York.

Mexico Refractories Co., Mexico, Mo., is building its fifth tunnel kiln in Mexico and anticipates that it will be in operation by the middle of the year. This unit and a new calcining kiln completed earlier this year increase the capacity of the Mexico plant more than 20 per cent. Stockholders of the company voted recently to complete the merger into Mexico Refractories of Niles Fire Brick Co., Niles, O.; National Refractories Co., Van Dyke, Pa.; and Big Savage Refractories Corp., Fostburg, Md. All have been wholly owned or controlled by Mexico Refractories.

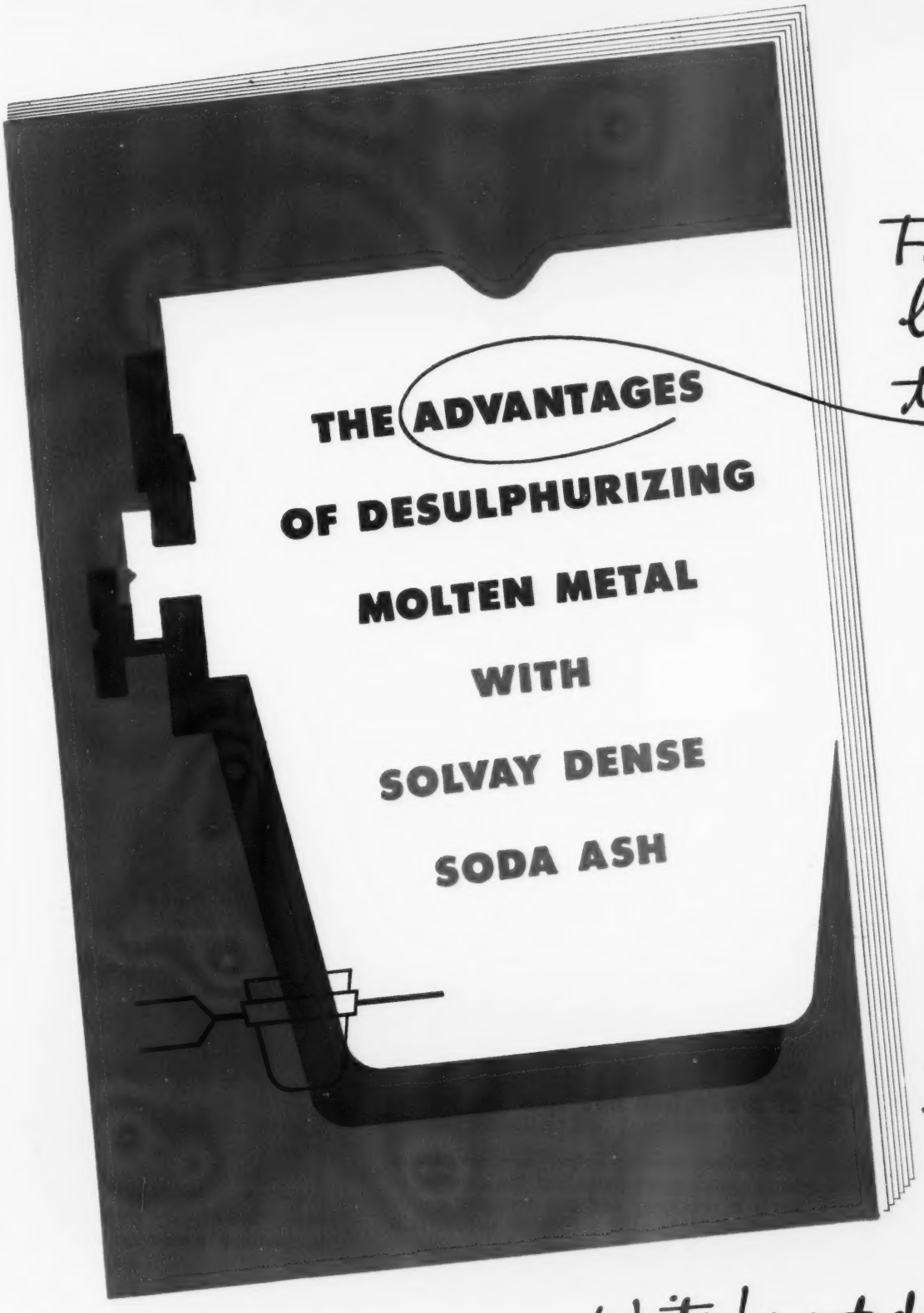
Minneapolis-Moline Co., Minneapolis, has suspended foundry operations at its Hopkins, Minn., plant. Casting operations have been moved to the company's tractor plant in Minneapolis. As many as possible of the 100 workers affected by the shutdown will be transferred to the tractor plant foundry or absorbed in other Hopkins operations. The Hopkins foundry will be closed for an indefinite time, the company states.

Climax Molybdenum Co., New York, will double its production capacity of pure molybdic oxide by installing a second sublimation furnace at its plant in Langeloth, Pa. Current capacity is 2,700,000 lb per year. Construction is expected to be completed by early September. Rust Engineering Co., Pittsburgh, is the contractor.

Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich., has appointed Francis & Sims Inc., 2855 West Eighth Ave., Denver, to sell and service its line of industrial trucks. The new dealer's territory includes all of Colorado and parts of Wyoming and Nebraska.

Industrial Heating Equipment Association, Washington, reports that in spite of a dip of 4½ per cent during March, 1956, from the 1955 figure for the same month, the industrial heating industry is operating at a record peacetime rate. Orders received for industrial furnaces during

CELEBRATE 30 YEARS TOGETHER: Thirty years have brought many changes to Texas Electric Steel Casting Co., Houston, Tex. The original plant was opened in April, 1926, with 20 employees and 6000 sq ft of floor space. Today, in a location it moved to in 1929, the company employs 280 persons and covers 15 acres. Above, Wilson Dedmon, left, who has the longest service at TESCO, is looking at an old photograph of the plant with Thomas H. Shartle, president, center, and A. B. Keckley, vice president and general manager, on right. Mr. Dedmon has been with the firm for 30 years, since its inception



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March totaled $7,025,034, which contrasts with $7,344,723 in March, 1955. The first quarter figure for 1956 is $29,431,973. In 1955, it was $17,-933,445.

Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., will be sold to Textron American Inc. for $15,-500,000. Stockholders also voted to change the concern's name to Ridgeway Corp., reserving use of the Campbell, Wyant & Cannon name to Textron, which will operate the company as a division. Sole assets of Ridgeway will be the cash received from Textron.

American Steel Foundries, Chicago, is acquiring a 15-per-cent interest in Cobrasma, a Brazilian company. Cobrasma operates a steel foundry in Brazil for the production of freight car castings. It also includes a carbuilding shop, a forge shop and facilities for producing steel castings for other industries. Cost of the investment will be about $1,-000,000.

Globe Iron Foundry, Bell Gardens, Calif., will construct a one-story, 30 x 100-ft addition to its plant at 5649 East Randolph St.

Fond du Lac Pattern Works Inc. has been formed in Milwaukee with an authorized capital stock of 400 shares of common of no par value. Incorporation papers were signed by Clarence A. Baumgardt, 3628 West Pierce St., Milwaukee.

Baker-Raulang Co., Cleveland, has established a new branch office at 1822 Young St., Dallas, Tex., to handle sales and service of its line of industrial trucks. Norman F. Burdette is manager.

Development and Research Division, International Nickel Co., New York, has moved the office of its St. Louis technical field section to Room 201, 10 South Brentwood Blvd., St. Louis 5.

Ferro Cast Corp., Santa Monica, Calif., has completed negotiations to lease a 15,000-sq-ft plant at 2202 Broadway, Santa Monica. Ferro produces precision investment castings by the lost-wax process.

Colorado Fuel & Iron Corp., has moved its Chicago district sales office and warehouse to larger quarters at 3838 West 51st St., Chicago 32.

Cooper Alloy Corp. plans a $500,-000 expansion program at its Hillside and Clark Township, N. J., plants. Construction of 7800 sq ft of expanded foundry area at Hillside is to be completed this summer. At Clark, where the company's aircraft products division is located, the expansion will increase production of rolled and welded aircraft rings by early fall.

Cargan Products Co. has been incorporated in Milwaukee, with an authorized capital stock of 500 shares of common with par value of $100 per share, to manufacture and deal in foundry cupola mixes. Incorporation papers were signed by Leo J. Federer and D. C. James. E. N. Carpenter is the registered agent, at 606 West Wisconsin Ave., Milwaukee.

Bellows Co., Akron, manufacturer of air cylinders and other pneumatic work devices, has consolidated all its West Coast activities in a new building erected by the company at 926 Western Ave., Glendale, Calif. The new facility also will serve as headquarters for the Smith Johnson manufacturing division of Bellows.

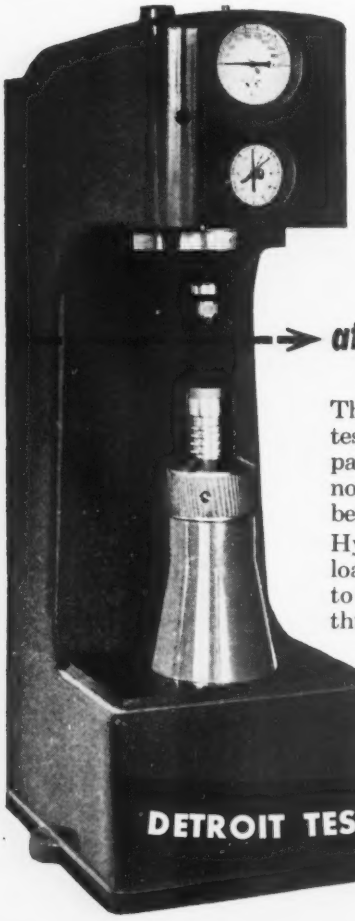
Roots-Connersville Blower, Division of Dresser Industries Inc., Connersville, Ind., has established a Pittsburgh sales office at 2411 Grant Building. Edward N. Bonnett will head the new office, which is responsible for western Pennsylvania and the northern counties of West Virginia.

Tri-State Foundry Co., 4785 Morse St., Cincinnati, suffered damage estimated at $20,000 when many patterns were destroyed in a fire which swept its storage and cleaning building Apr. 23.

Alloys Foundry Co., 1725 West Walnut St., Chicago, has been acquired by Chester K. Faunt, Christensen & Olsen Foundry Co., Chicago. The foundry produces high-alloy castings in sizes up to 250 pounds.

Material Handling Systems has been named a representative of Yale & Towne Mfg. Co., Philadelphia, for the sale and service of its industrial trucks in the ten-county Dayton, O., industrial area.

Erie Strayer Co., Geist Rd., Erie, Pa., has appointed Southwood Machinery Sales, U. S. Route 31, Stop 12, Indianapolis, to distribute its line of clamshell buckets in the southern Indiana area.



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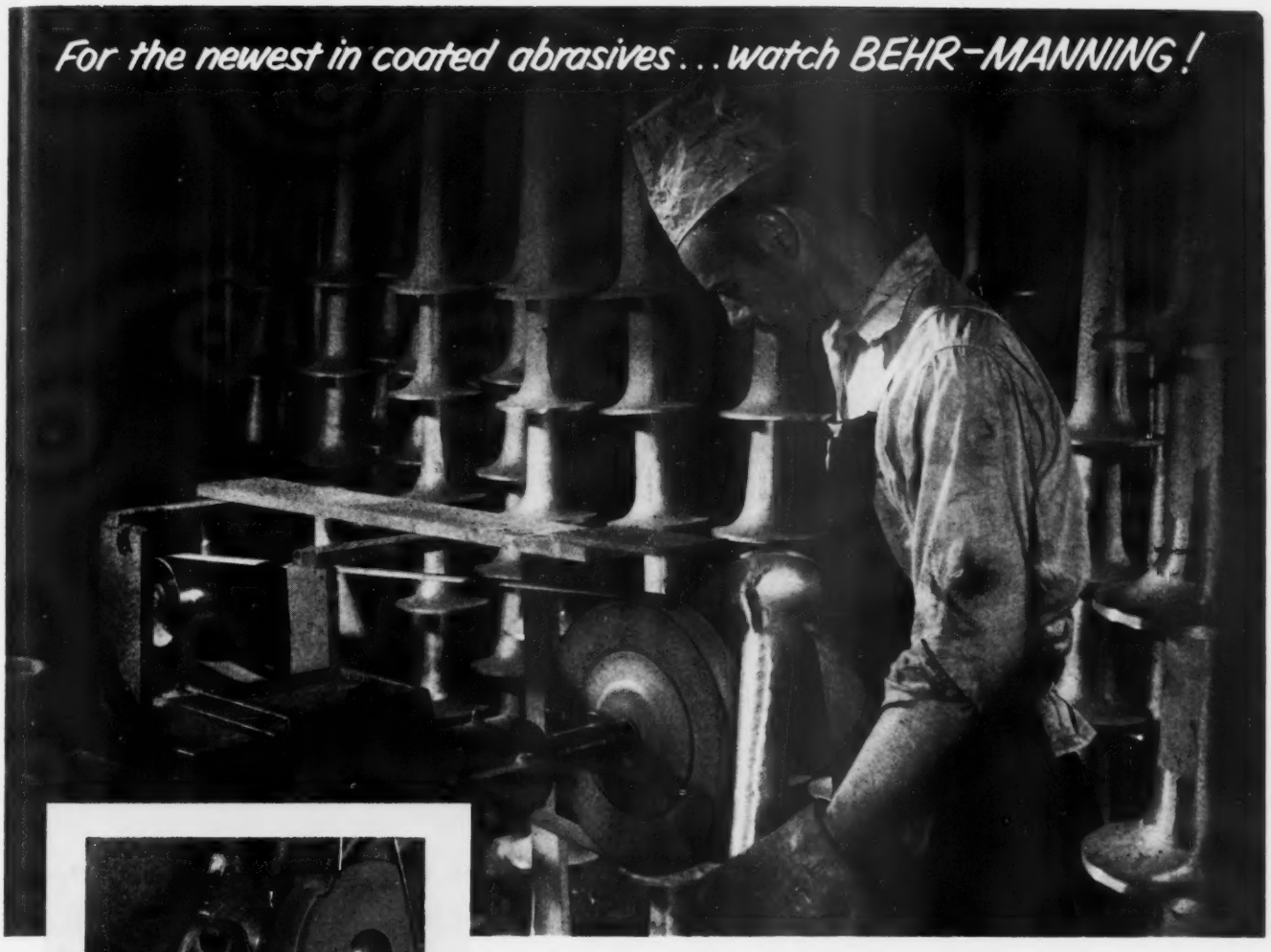

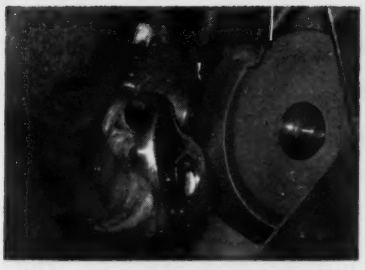

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Man to Man

By RALPH L. LEE

"Any master planner who does not research the boys down in the plant before he crystallizes his master plans is missing a bet"

UNDER the heading "Ideas for Industry," the Apr. 23rd issue of *Steel,* our sister magazine, carried quite an article on a new technique called "brainstorming." The basis of the idea is to get together a group of employees—not necessarily the creative geniuses or professional thinker-uppers, but folks picked at random—and to ask them just how they would go about solving one of the company's more troublesome problems.

The novel feature of the scheme seems to be outlawing kibitzing, criticism and "considering the source" while the session is on. After the meeting, behind closed doors, the sifting and evaluating is done carefully. But all of the ideas, good or bad, are recorded, for every once in a while one or two cockeyed brainstorms spark a train of thought that leads to profitable developments never even dreamed of by the brains.

I guess most of us know that there is a national association of suggestion system promoters and operators called Employee Suggestion Systems. One of my associates—a former assistant, in fact—helped to start the organization. Having been invited to speak before various chapters, I got a picture of how extensively suggestion systems have taken hold and spread. In fact, I don't believe I ever have heard of anyone in industry who didn't have a good word for encouraging employees to make suggestions and for organized methods of getting them to do it.

From the folks who spend all of their time operating suggestion systems, I learn that it's pretty tough sledding to keep these activities from dying on the vine. Even with juicy prizes, awards at banquets, certificates and badges, they have to keep beating the old tom-tom.

The most interesting thing to me, however, was to learn from the most successful suggestion system operators that important as attractive awards are to employees whose suggestions are accepted, the procedures for turning down suggestions are far more important to the success of the activity.

This discovery, together with the need for organized employee idea and suggestion pumping, might well point to something lacking in the day-to-day and man-to-man relationships between employee and employer. It also might indicate that considering the source of ideas has been carried too far in the daily acceptance and rejection of ideas from employees.

My Dad had a supervisor one time who received all suggestions from those who reported to him with a hollow, deprecating laugh, immediately followed by a shallow, meditative frown. The laugh was sort of an advertisement of ridicule in case the idea turned out to be cockeyed and the frown for having considered it in case it turned out useful. He wanted to be on the safe side in either event. Face saving was his greatest concern. Needless to say, this supervisor didn't last very long.

Thank Heaven, the unapproachable Bull of the Woods type of boss is practically extinct. We must admit, however, that there still are some, burdened with a consciousness of their rank and its responsibilities, who effectively close the door to timid employees with suggestions sometimes worth their weight in gold. Such employees would rather take a licking than bring up the subject.

"My Dad had a supervisor who greeted all suggestions with a hollow laugh"

Then, there are frustrated bosses, with ants in their pants, 'way behind schedule and so intent on catching up that it would be a waste of time for any employee even to try to get an idea across.

Unfortunately, there are some bosses (the glory grabbers) who take the suggestions of their employees and sell them as their own. Suggestion systems would be a godsend to employees in this situation—that is, if they didn't just dry up.

There also are shops, highly departmentalized, specialized and systematized, in which all plans for production, tooling and processing seem to come from a handful of creative geniuses and professional technicians in the front office, organizations with no provisions for crediting the humble source of many of the employee's ideas which trickle up through organization channels and become a part of the master plans.

Any creative instinct, no matter how strong, couldn't live long in such an atmosphere. Any master planner who does not research the boys down in the plant before he crystallizes his master plans is missing a bet.

It seems to me that it is perfectly natural for anyone who works day after day on a job to have ideas popping into his head about his work—more so for some persons, of course, than for others. Then, too, I'm sure that it is perfectly natural for anyone with ideas to get a bang out of telling someone about them, particularly someone who can do

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Attachments Convert Drill Press To Milling and Sanding Operations

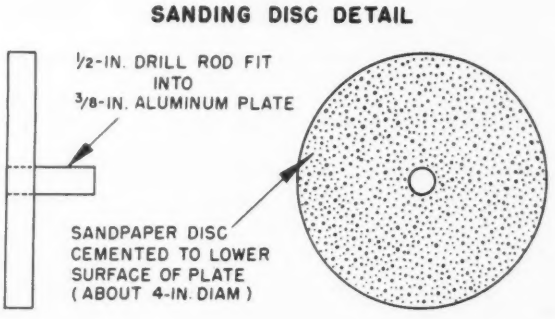
By ORMIE R. SCOTT
29 Glenwood Ave.
Guelph, Ont.

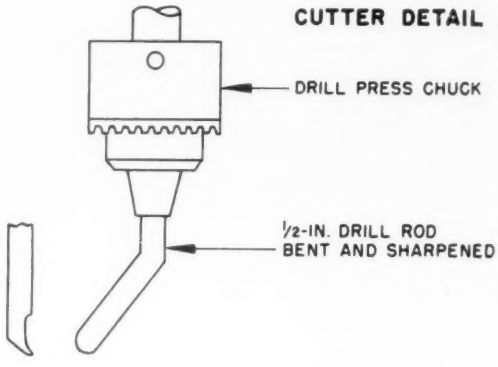
USEFULNESS of a patternshop drill press can be increased with a few simple attachments. For instance, it can be adapted to milling wood smoothly and to accurate dimensions. The machine must be capable of fairly high speed and have bearings in good condition. It also must have an adjustable stop and spindle lock. If the table work area is small, it can be increased by fastening a piece of ½-in. aluminum plate over the original table. Plate should be shimmed, if necessary, so that it is in a plane at 90 degrees to the spindle, otherwise step cuts will result.

For small work a good cutter can be made from a ¾-in. drill with the head flattened and relieved. For larger work a tool can be made from a piece of ½-in. drill rod bent and sharpened, as shown, to a half-round on one end.

Depth of the milling cut should be limited to 1/32-in. and stock should be moved against the rotation of the cutter to avoid its grabbing. Finely adjusted cuts can be made by keeping the spindle adjustment nut always in contact; a slight turn of the nut and relocking the spindle provides close control of cutting action.

Final finish of the stock can be achieved by using a disc sander made as shown here.


SANDING DISC DETAIL
½-IN. DRILL ROD FIT INTO ⅜-IN. ALUMINUM PLATE
SANDPAPER DISC CEMENTED TO LOWER SURFACE OF PLATE (ABOUT 4-IN. DIAM.)



Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

something about them and give credit for them. If the truth were only known, I'm sure we'd all be amazed if we knew the actual source of the sparks which triggered some of our most important developments.

With all due credit to employee suggestion pumping from the front office on a campaign and mass-production basis, it seems to me that a great deal of thought can profitably be given to opening the bottlenecks of class and rank consciousness and of "considering the source" in order to achieve a free flow of the ideas which are bound to occur during the daily grind.

Of one thing I'm sure: Merely advertising the open-door policy will not do the trick. Every link in the chain, from the lowliest to the mightiest, needs to be conditioned for transmission, and anyone in this chain who would dare to laugh at a suggestion sincerely made should be thrown into outer darkness and fed on bread and water until he sees the light.

After explaining the ABCs of how castings are made to the 12-year-old daughter of a very good friend of mine, I made a mold for her and closed it, ready to pour. As I was sticking the pyrometer into the molten metal, the little girl said, "But Doctor Lee, there's one thing I can't quite understand. How can the metal go down inside with that wooden piece still in there?"

Magnesium Alloys Topic of New Government Reports

Study of the constitution and development of magnesium alloys conducted for the Air Force has been released to industry by the Office of Technical Servces, U. S. Department of Commerce, Washington 25, D. C. "Magnesium Alloy Research Studies" (PB 111762) completed under Wright Air Development Center, is a report devoted to the constitution of alloys in the solid state in the magnesium corner of the magnesium-lithium-aluminum and magnesium-lithium-zinc alloy systems, development of magnesium alloys with a low alloy content for high-ductility sheet, and study of single crystals of magnesium alloys. Price is $3.50.

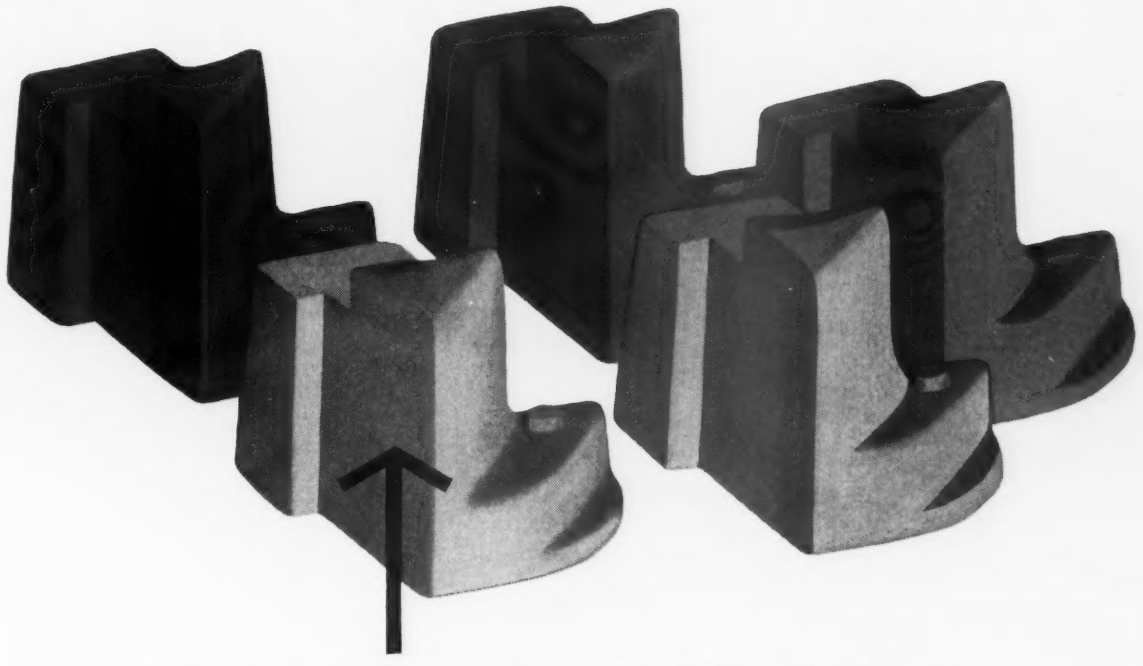
Book Review

Purchase Law Manual, by Albert Woodruff Gray, cloth, 5½ x 8½ in., 390 pages, published by Book Division, Conover-Mast Publications Inc., New York and Chicago. Price $6.

A deskbook type of manual written specifically for the purchasing agent, this volume is designed to provide a quick reference concerning the law that affects a purchaser's relationship with his suppliers.

It is divided into 56 short chapters, each prefaced with a few reminders in bold-faced type of the key points to keep in mind when dealing with the particular phase of law covered in the chapter. The author has had 25 years of legal experience upon which he has drawn in preparing his book.

SIPAC T.M. non-carbonaceous core coating—the latest addition to THE UNITED STATES GRAPHITE CO. line



distinctive golden color identifies this highly refractory, low-cost, clean-to-handle coating

Sipac, a new core coating that contains no carbon and gives cores fine smooth surfaces, has just been made available to foundries by The United States Graphite Co. Sipac is a complete formula already in suspension, and needs only the addition of water to the correct Baumé before application (the suspension is so stable that you may dilute it to a Baumé of 32 without settling). A highly refractory material that will not flake off, Sipac completely seals core surfaces and works well with any foundry sand. It anchors to cores exceptionally well, and gives a penetration of 3 to 5 grains with very low cost per covered area. Sipac is clean to handle and its bright golden color makes cores highly visible which is helpful when placing cores in the drag. Sipac is ideal for steel, malleable, and non-ferrous castings as well as gray iron, because it is non-carbonaceous and inert and will not react with any molten metal. Sipac is a concentrated paste which mixes readily with water, and you can apply the diluted wash by swab, dip, brush, or spray methods. Sipac will result in a fine finish for your castings, and you can use this one wash for all jobs. Shipped in 55 gallon drums. Write today for details about Sipac or any of the other United States Graphite Company core or mold coatings.

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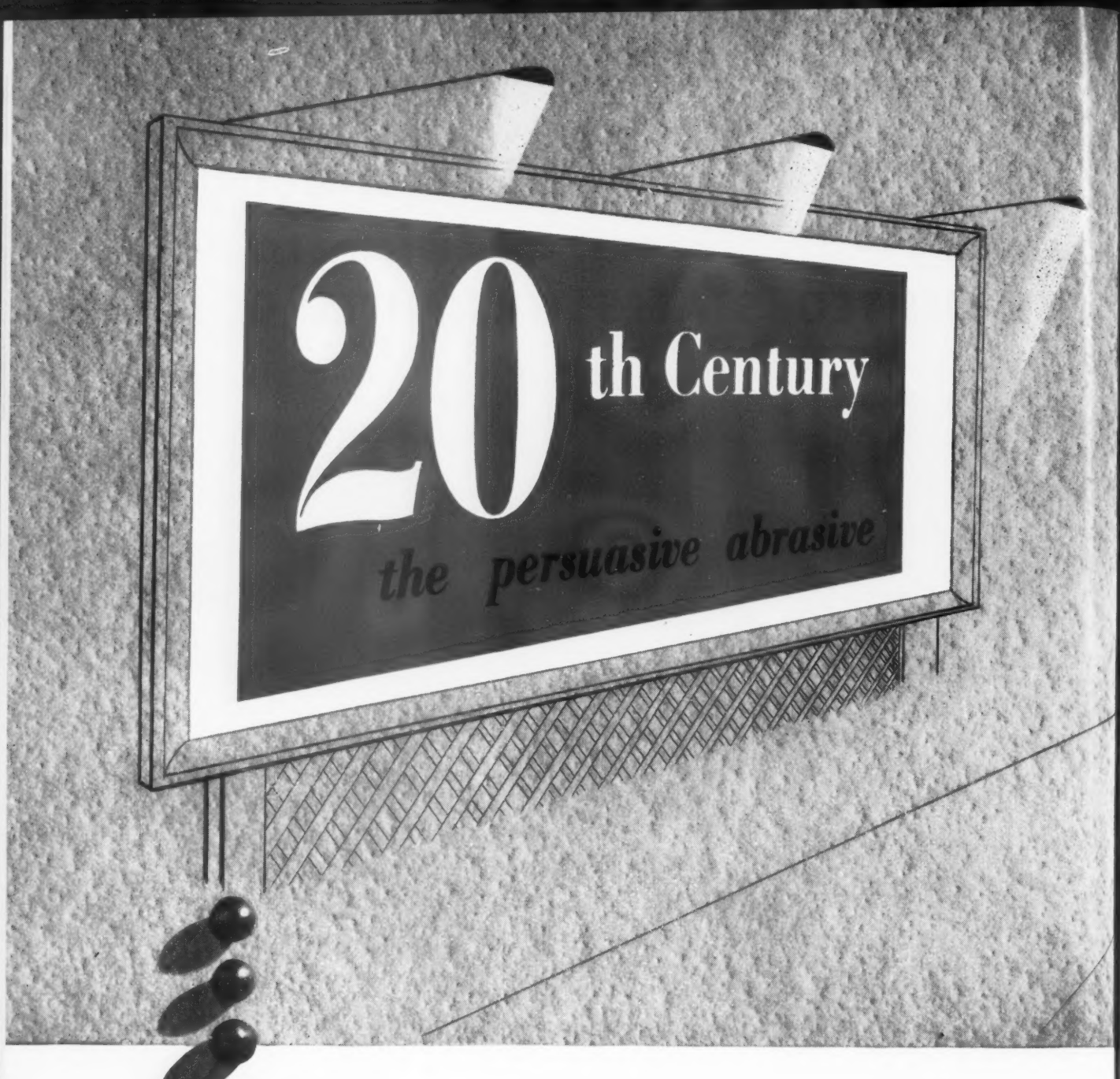
DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN



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Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1954	624,973	158,473	214,408	245,291	.....
1955					
Feb.	66,869	13,579	24,319	28,234	108,939
Mar.	78,958	16,019	29,029	33,229	110,046
Apr.	73,049	14,041	28,028	30,208	109,156
May	71,691	14,235	25,597	31,243	104,984
June	68,473	14,920	24,682	27,939	102,799
July	55,033	11,716	21,006	21,656	101,024
Aug.	64,864	14,916	22,267	27,004	105,994
Sept.	67,069	14,769	23,075	28,532	111,696
Oct.	72,197	14,485	25,135	31,741	120,222
Nov.	75,065	14,327	26,267	33,852	126,954
Dec.	75,275	15,291	25,031	34,347	123,363
Total	832,957	171,656	298,115	354,804	.....
1956					
Jan.	74,152	15,861	24,528	33,253	121,924
Feb.	73,096	15,560	23,963	32,949	115,958
Total	147,248	31,421	48,491	66,202	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1954	812,016	461,982	.....	.....	.....	.....	.....
1955							
Feb.	85,979	48,721	.....	.....	.....	.....	101,766
Mar.	102,364	60,063	.....	.....	.....	.....	99,730
Apr.	101,226	57,397	.....	.....	.....	.....	104,091
May	98,397	57,317	.....	.....	.....	.....	106,446
June	99,456	60,261	.....	.....	.....	.....	107,559
July	75,570	44,914	.....	.....	.....	.....	115,420
Aug.	82,448	48,126	.....	.....	.....	.....	123,473
Sept.	87,215	55,471	.....	.....	.....	.....	116,636
Oct.	90,866	53,804	.....	.....	.....	.....	121,261
Nov.	99,280	58,069	.....	.....	.....	.....	116,981
Dec.	99,946	60,409	.....	.....	.....	.....	123,107
Total	1,104,775	652,552	.....	.....	.....	.....	.....
1956							
Jan.	93,562	54,618	79,406	45,747	14,156	8,871	116,520
Feb.	93,533	54,466	80,601	47,606	12,932	6,860	113,616
Total	187,095	109,084	160,007	93,353	27,088	15,731	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1954	835,930	753,179	48,848	.....
1955				
Feb.	75,253	67,768	4,598	37,520
Mar.	92,149	83,149	5,649	42,940
Apr.	84,183	75,903	5,152	51,111
May	85,008	76,064	5,513	49,198
June	90,476	80,869	5,840	45,820
July	65,816	59,138	3,998	48,085
Aug.	87,206	77,721	5,322	51,251
Sept.	89,600	80,481	5,603	57,313
Oct.	91,192	82,958	4,513	56,751
Nov.	90,345	80,934	5,807	57,049
Dec.	88,287	78,327	6,368	57,146
Total	1,011,748	907,852	82,201	.....
1956				
Jan.	89,767	80,116	6,135	58,445
Feb.	91,706	82,244	5,888	57,515
Total	181,473	162,360	12,023	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1954	25,777	22,950	.....
1955			
Feb.	2,160	2,009	7,376
Mar.	2,572	2,311	7,011
Apr.	2,633	2,405	6,800
May	2,399	2,174	6,530
June	2,367	2,098	6,346
July	1,920	1,763	5,912
Aug.	2,176	2,002	5,964
Sept.	2,478	2,260	5,670
Oct.	2,302	2,077	5,394
Nov.	2,325	2,148	5,805
Dec.	2,255	2,018	5,981
Total	27,892	25,332	.....
1956			
Jan.	2,959	2,600	6,237
Feb.	2,977	2,720	6,704
Total	5,936	5,320	.....

PRODUCTION WORKERS

Estimated Number
(Thousands)

	Feb. 1956	Jan. 1956	Feb. 1955
Ferrous	259,900	260,100	221,500
Nonferrous	88,500	90,600	82,300

Average Weekly Earnings

Gray Iron	83.03	83.23	81.12
Malleable Iron	84.66	86.32	82.76
Steel	95.04	95.04	83.44
Nonferrous	87.10	85.84	84.45

Average Weekly Hours

Gray Iron	40.9	40.8	41.6
Malleable Iron	40.9	40.9	41.8
Steel	43.2	43.2	40.7
Nonferrous	40.7	40.7	40.6

Source: Bureau of Labor Statistics

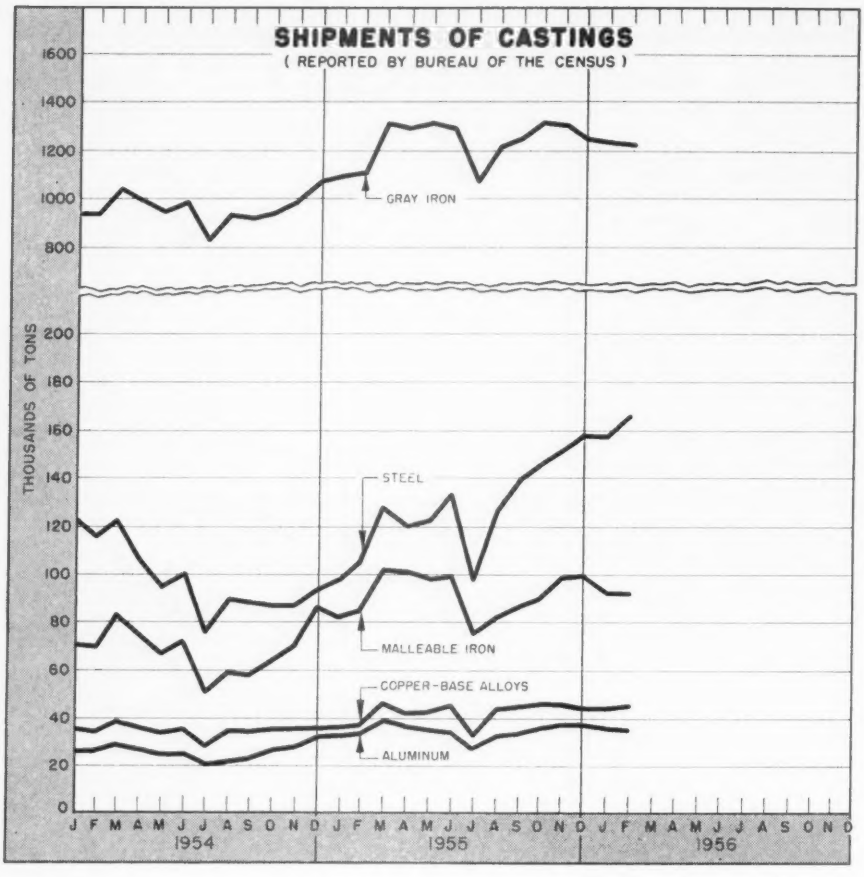
GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[3]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[3]	Total[3]	
1954	11,532,158	6,322,989	7,292,292	3,064,886	1,784,625	843,899	325,859	1,376,671	743,711	.....
1955										
Feb.	1,106,165	578,171	720,304	291,675	196,118	99,794	27,401	95,285	67,057	852,168
Mar.	1,314,918	688,733	847,874	334,287	217,571	109,681	36,732	129,746	82,995	934,224
Apr.	1,293,678	679,867	819,872	319,149	216,116	108,490	35,415	145,871	76,404	966,057
May	1,310,424	707,105	803,897	315,072	227,236	117,915	35,966	168,772	74,553	937,949
June	1,296,196	715,862	793,067	327,520	228,044	117,727	43,807	147,351	83,927	981,918
July	1,069,711	579,122	634,869	246,297	210,130	112,137	28,181	129,191	67,340	1,049,565
Aug.	1,226,312	688,317	718,423	301,502	238,007	121,071	29,298	156,074	84,510	1,160,466
Sept.	1,252,736	712,688	731,073	314,223	244,199	124,811	29,953	165,332	82,179	1,150,933
Oct.	1,310,309	713,671	795,875	327,527	245,749	122,722	31,877	160,875	75,923	1,113,336
Nov.	1,305,633	696,523	797,854	327,580	262,506	127,739	29,795	148,560	66,918	1,061,546
Dec.	1,259,740	663,993	786,480	328,445	262,056	133,115	30,833	133,935	46,436	1,075,477
Total	14,837,745	7,987,205	9,161,685	3,715,963	2,739,864	1,392,209	385,041	1,681,630	869,558	.....
1956										
Jan.	1,249,518	677,017	769,826	326,269	257,150	132,581	32,408	131,346	58,788	1,157,818
Feb.	1,214,769	680,494	739,786	322,956	242,207	128,643	35,074	133,254	64,448	1,140,765
Total	2,464,287	1,357,511	1,509,612	649,225	499,357	261,224	67,482	264,600	123,236	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[3]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1954	1,184,096	880,158	135,581	802,321	580,474	120,309	381,285	303,428	15,315	.....
1955										
Feb.	106,430	80,729	16,501	74,709	55,014	15,381	38,945	25,715	1,120	202,301
Mar.	127,460	98,926	19,339	88,867	68,013	17,887	34,933	30,913	1,452	215,059
Apr.	120,053	92,237	16,646	84,247	63,244	15,163	35,806	28,993	1,483	221,336
May	122,465	92,713	16,810	85,950	63,182	15,335	36,515	29,531	1,475	225,302
June	133,887	102,457	19,591	93,417	69,986	17,979	40,470	32,471	1,612	251,416
July	97,875	71,170	11,631	68,094	48,140	10,666	29,781	23,030	965	354,628
Aug.	126,406	96,290	20,576	91,245	68,514	19,094	35,161	27,776	1,482	413,531
Sept.	140,843	107,622	23,594	100,775	76,156	21,991	40,068	31,466	1,603	420,616
Oct.	145,674	110,409	23,745	105,345	79,235	22,375	40,329	31,831	1,370	418,063
Nov.	152,381	116,908	25,635	111,517	84,064	24,050	40,810	33,518	1,585	453,113
Dec.	158,982	122,201	29,003	116,872	88,894	26,919	42,110	33,307	2,084	475,335
Total	1,530,694	1,166,706	236,880	1,088,345	814,258	219,602	445,769	354,452	17,278	.....
1956										
Jan.	158,618	123,343	27,954	116,092	88,480	26,362	42,526	34,863	1,592	519,401
Feb.	165,398	128,598	30,833	123,279	94,998	29,112	42,119	33,600	1,721	567,330
Total	324,016	251,941	58,787	239,371	183,478	55,474	84,645	68,463	3,313	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.



COKE PRODUCTION AND CONSUMPTION

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1954	59,526,723	59,139,159	2,479,926
1955			
Feb.	5,394,166	5,519,241	242,282
Mar.	6,235,909	6,306,723	286,072
Apr.	6,135,645	6,164,459	278,242
May	6,426,747	6,570,567	277,967
June	6,148,026	6,297,338	249,525
July	6,169,770	6,266,631	221,372
Aug.	6,395,422	6,439,101	249,425
Sept.	6,397,133	6,501,013	260,608
Oct.	6,630,609	6,813,118	283,818
Nov.	6,545,862	6,577,008	285,021
Dec.	6,865,032	6,949,073	284,936
Total	75,150,247	76,266,385	3,154,052
1956			
Jan.	6,914,836	6,182,704	275,660
Feb.	6,474,775	5,806,310	260,929
Total	13,389,611	11,989,014	536,589

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1955	1956
Jan.	25,201	27,736
Feb.	25,349	24,949
Mar.	29,713	28,310
Apr.	27,641	.....
May	23,708	.....
June	23,141	.....
July	18,513	.....
Aug.	27,013	.....
Sept.	26,349	.....
Oct.	25,228	.....
Nov.	25,102	.....
Dec.	21,448	.....
Total for year	298,406	80,995

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1954	520,501	322,845	.....
1955			
Feb.	58,585	35,893	73,858
Mar.	71,811	44,048	81,363
Apr.	71,595	45,477	81,756
May	63,735	38,124	74,472
June	66,569	42,753	71,344
July	47,928	27,429	68,927
Aug.	62,677	61,957	75,592
Sept.	62,030	43,498	80,660
Oct.	71,689	46,581	85,489
Nov.	75,099	47,572	93,001
Dec.	70,950	47,547	86,120
Total	781,254	516,351	.....
1956			
Jan.	68,050	67,346	83,234
Feb.	66,584	65,848	76,283
Total	134,634	133,194	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1955	1956
Jan.	81.0	195.6
Feb.	90.4	169.0
Mar.	163.6	152.7
Apr.	178.6	....
May	145.7	....
June	186.8	....
July	213.4	....
Aug.	134.0	....
Sept.	156.7	....
Oct.	108.6	....
Nov.	154.4	....
Dec.	183.9	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

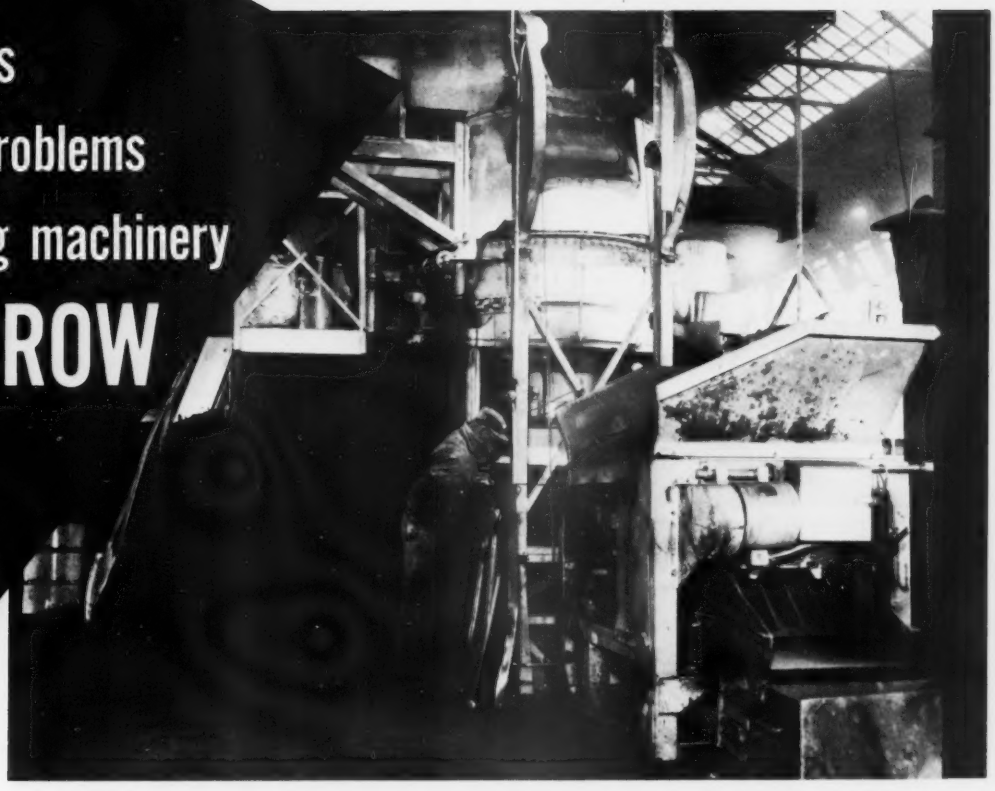
	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1954	54,780,758	8,542,581	855,207	6,100,444
1955				
Jan.	5,416,052	813,682	90,622	614,824
Feb.	5,350,452	823,465	91,916	577,296
Mar.	6,313,717	993,266	113,198	727,401
Apr.	6,239,036	975,751	108,965	726,138
May	6,415,947	963,082	109,074	745,060
June	6,117,573	928,908	116,419	733,573
July	5,447,130	730,735	81,216	623,623
Aug.	5,913,031	868,644	101,607	765,343
Sept.	6,060,491	881,158	119,550	753,318
Oct.	6,443,349	944,685	113,411	820,642
Nov.	6,441,351	952,906	112,056	839,971
Dec.	6,496,796	910,675	115,436	830,404
Total	72,654,925	10,786,957	1,273,470	8,757,593
1956				
Jan.	6,688,977	909,201	114,378	880,980

PIG IRON PRODUCTION AND CONSUMPTION

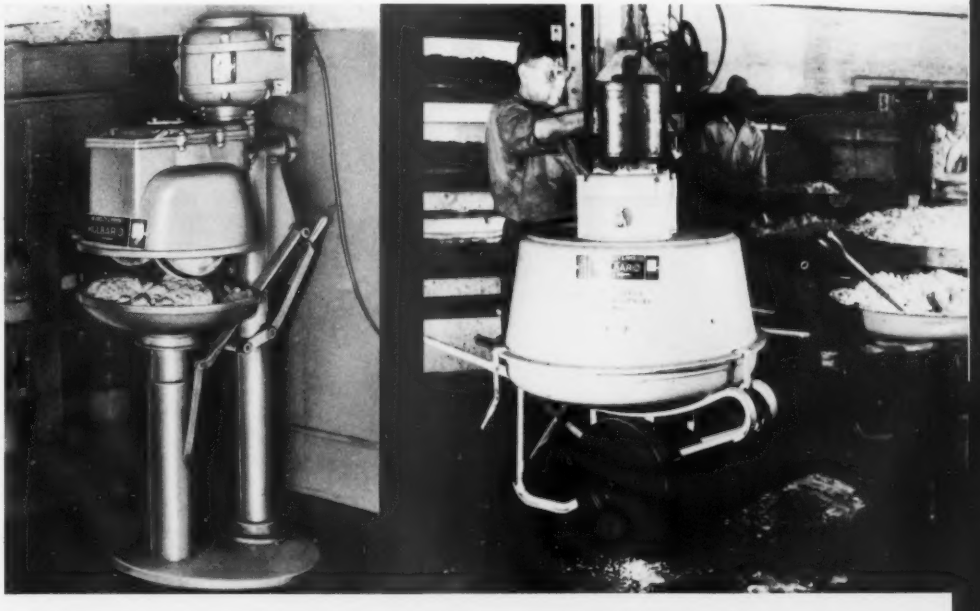
	Production** (Standard grades—net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1954	58,113,924	2,241,436	2,798,646	47,485,047	5,587,465	52,373,541	4,364,418	215,158	155,258
1955									
Feb.	5,394,585	209,852	252,860	4,425,080	506,793	4,964,515	409,141	20,576	22,551
Mar.	6,406,902	221,437	359,413	5,239,116	586,936	5,830,943	480,639	24,066	15,981
Apr.	6,329,927	210,085	305,188	5,068,506	746,148	5,725,258	467,709	21,536	12,857
May	6,753,236	246,661	342,544	5,385,299	788,732	6,044,882	471,657	21,448	20,085
June	6,494,838	238,412	347,631	5,245,861	662,934	5,774,896	454,751	22,871	21,697
July	6,329,393	233,235	344,365	5,116,960	634,833	5,430,550	361,171	16,483	19,535
Aug.	6,529,580	251,459	319,951	5,214,901	743,269	5,769,689	442,532	22,014	25,685
Sept.	6,653,578	252,630	343,919	5,397,134	659,895	5,903,190	445,099	23,340	24,552
Oct.	6,905,280	267,405	315,045	5,647,527	675,303	6,193,512	470,610	22,659	23,328
Nov.	6,636,649	241,727	353,713	5,404,584	636,625	5,973,223	469,485	22,621	18,148
Dec.	6,887,667	242,446	329,607	5,660,307	655,307	6,131,680	444,459	23,520	21,971
Total	77,114,073	2,858,957	3,884,971	62,570,394	7,799,751	68,944,698	5,326,534	260,008	246,406
1956									
Jan.	6,985,945	210,755	317,216	5,806,140	651,774	6,275 224	441,634	24,062	11,766
Feb.	6,539,199	229,440	370,208	5,350,650	588,901	.....	.....	.....	.....
Total	13,525,144	440,195	687,484	11,156,790	1,240,675	.....	.....	.....	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

solve today's mulling problems with the mulling machinery of TOMORROW



SPEEDMULLOR-PREPARATOR UNITS started the trend and have continuously led the trend towards the adoption of mulled sand practice in jobbing foundries. By providing these foundries with compact low-cost equipment to do their complete sand preparation job, these units have brought controlled sand practice within reach for the first time. One of hundreds of such units in operation, this Speedmullor-Preparator Unit is provided with a double discharge to supply conditioned and mulled sand directly to a portable Sand-slinger tank from the discharge at right, and to the floor at left for delivery to molding stations by front-end loader.



MULBAROS AND LAB MULBAROS provide all foundries — large and small — with modern efficient laboratory and portable sand mulling equipment. The Lab Mulbaro is the only mullor specifically designed for use by the foundry sand laboratory. Mulling small batches of laboratory specimen size, the Lab Mulbaro utilizes removable, easily cleaned mulling bowls for precise laboratory control. The rubber-tired mulling mechanism may be tilted for easy and complete cleaning. The Mulbaro offers all of the portability features of the only really portable mullor. Only the sand need be moved in the Mulbaro's light-weight mulling bowls . . . no need to move the entire machine as in some so-called portable mixers. With the Mulbaro, two or more mulling bowls may be used with a single Mulbaro giving doubled or tripled capacity at little added cost.

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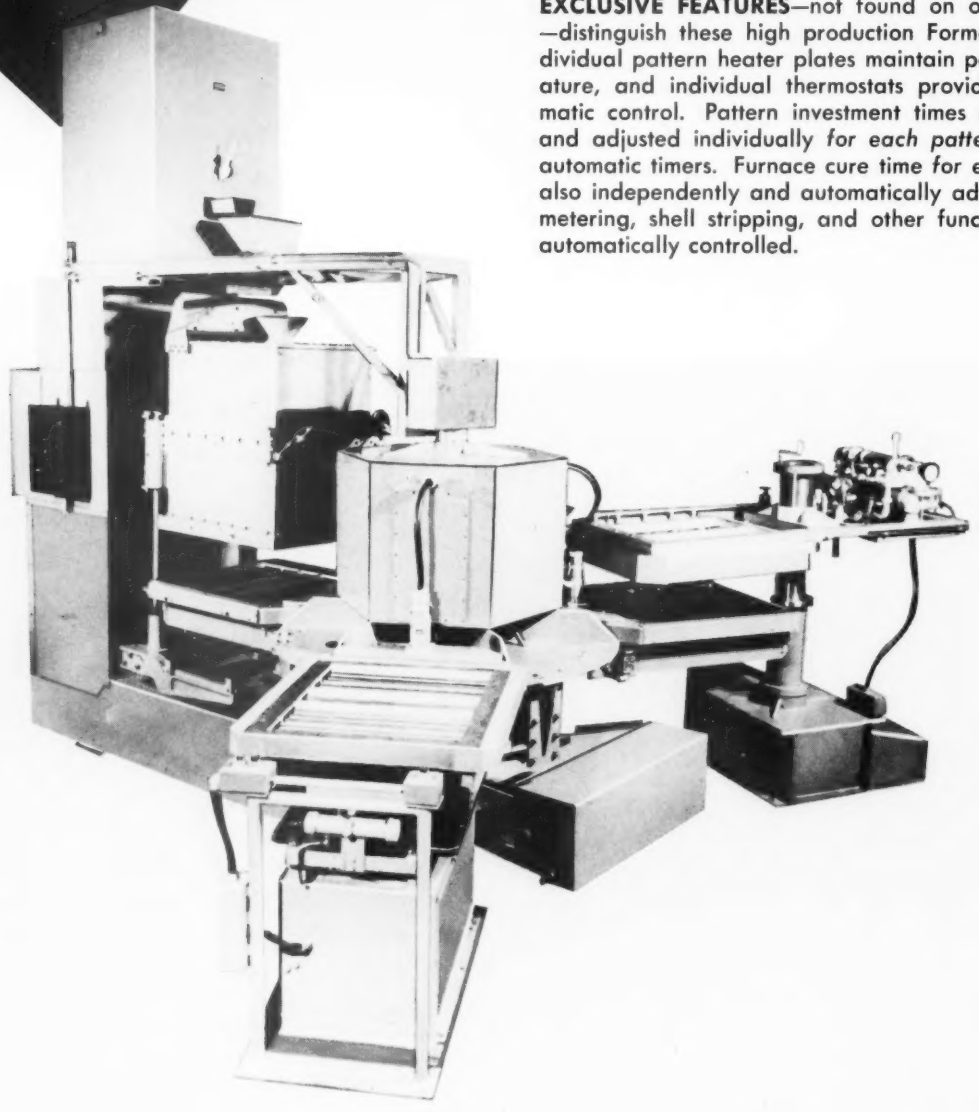
SHELL MOLDING MACHINES

Modern shell molding installations must be designed fo production. That's why these Formatic Units are built t meet real production requirements. The Rotary Formati Units are manufactured in one, two, three, four and five pattern models. It's possible to start with the simples real production installation—a single-pattern rotary uni —and then add pattern stations as requirements increase Production capacities range to 120 complete shells per hour. Pattern sizes up to 24 x 42 inches may be accommodated.

EXCLUSIVE FEATURES—not found on other machines —distinguish these high production Formatic Units. Individual pattern heater plates maintain pattern temperature, and individual thermostats provide close automatic control. Pattern investment times are controlled and adjusted individually *for each pattern* by precise automatic timers. Furnace cure time *for each pattern* is also independently and automatically adjustable. Sand metering, shell stripping, and other functions are also automatically controlled.



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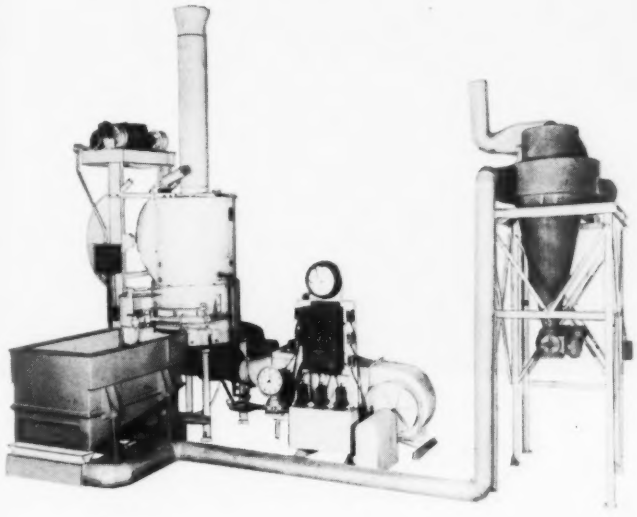
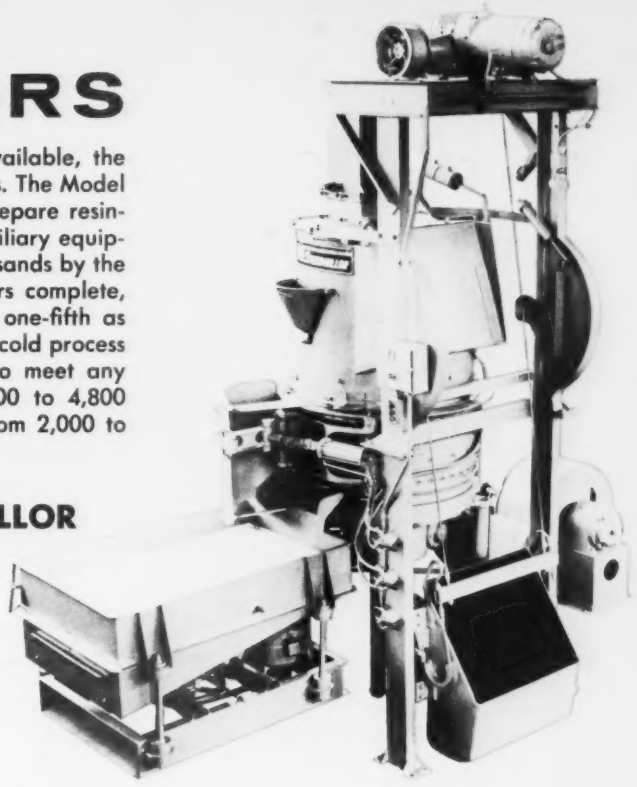
B & P SHELL SAND

SPEEDMULLORS

The most advanced shell sand preparation equipment available, the Shell Sand Speedmullors, offer dozens of exclusive features. The Model HP Shell Sand Speedmullor is the only mullor that can prepare resin-coated shell sands in a single production cycle without auxiliary equipment. For those foundries wishing to prepare resin-coated sands by the cold process, the Model CP Shell Sand Speedmullor offers complete, single unit preparation in time cycles only one-fourth to one-fifth as long as those required by other mixers. Thus, for either the cold process or the hot process, there is a Shell Sand Speedmullor to meet any foundry's exact requirements. Capacities vary from 2,400 to 4,800 pounds per hour for the Model HP Speedmullors, and from 2,000 to 20,000 pounds per hour for the Model CP Speedmullors.

MODEL CP SHELL SAND SPEEDMULLOR



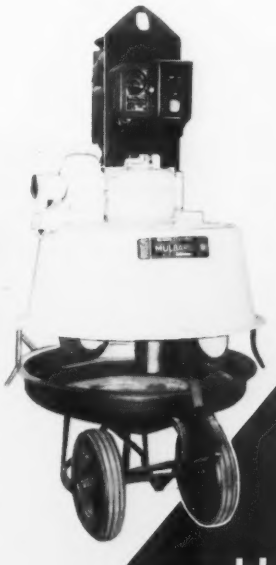


MODEL HP SHELL SAND SPEEDMULLOR

SHELL SAND

MULBARO

Specifically designed for the requirements of the limited shell molding program, the Shell Sand Mulbaro provides exact, automatically-timed preparation by the cold process. Resin-coated shell sand may be prepared for either shell molds or cores. Capacity is up to 900 pounds per hour depending on the type of sand and resin used. Like the standard Mulbaro, the Shell Sand Mulbaro may be used with several mulling barrows to provide additional capacity from a single machine. The lightweight, rubber-tired barrows are wonderfully convenient for delivering mulled resin-coated sand to shell molder or coremaker.

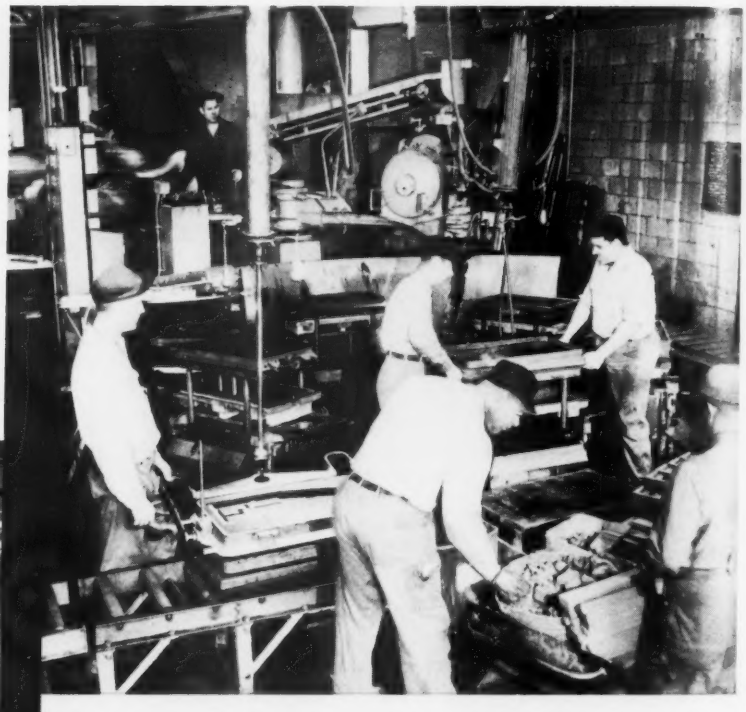


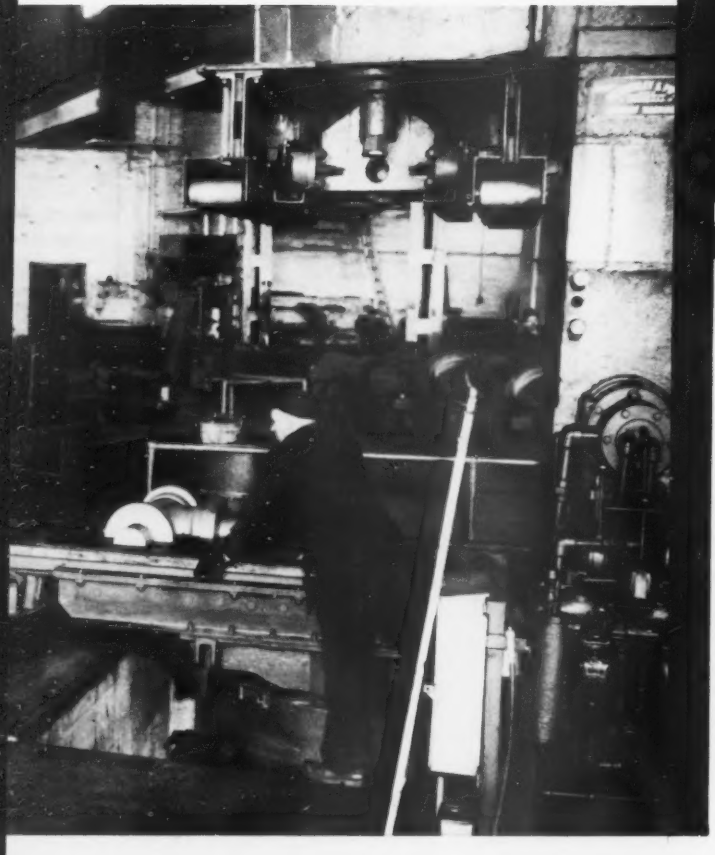
solve today's shell sand processing problems with the machinery of TOMORROW

MACHINERY OF TOMORROW!

solve today's molding problems with the molding machinery of TOMORROW

HYDRA-SLINGER ROTO-MOLD UNITS truly represent the most modern approach yet conceived to the molding problems of jobbing and production foundries alike. Here, in these compact units, the foundry gains all of the advantages of high speed, multiple-station operation, without the pattern limitations imposed by ordinary production equipment. Flask handling, molding, strike-off, mold handling and finishing are all accomplished in a smooth Roto-Mold paced sequence — yet, patterns may be changed quickly without interruption. This continuously rotating unit, utilizing Champion Speed-Draw machines, handles production work. Other Roto-Mold units, with B & P Rol-A-Draw rollover and draw machines, are designed specifically for jobbing work.





B & P ROL-A-DRAWS are now available in a full range of sizes with capacities to a full 10,000 pounds. They appreciably extend the range and application of Hydra-Slinger Roto-Mold and Sandslinger Roto-Mold Units which they are specifically designed to serve. These Rol-A-Draws offer draw capacities up to 36 inches with maximum "daylight" dimensions of 76 inches in depth. With advanced Rol-A-Draw open-end design, mold length is not limited, and mold widths to 60 inches can be handled.

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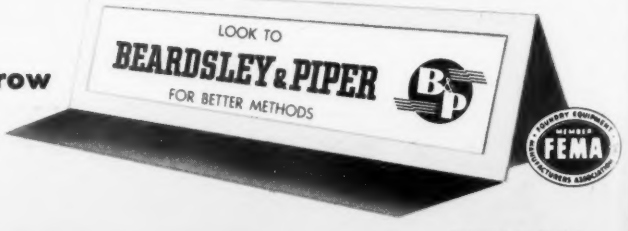

Printed in U.S.A.

Foundry Equipment Makers Issue 1956 Yearbook

The Foundry Equipment Manufacturers Association, One Thomas Circle, Washington, has issued the 1956 edition of its yearbook, which contains a variety of information concerning the organization and its membership.

A foreword describes the history and objectives of the group and predicts progress in the foundry industry as a result of continued co-operation of the industry and firms which manufacture the equipment it uses. The booklet also contains listings of officers, committees, members, membership classifications and similar data.

Plant Operations Booklets

Designed to help small firms improve their operations, Small Business Administration, Lafayette Building, Washington, has issued two leaflets, available upon request from any of the agency's field offices.

"Records Retention in Small Business" explains how an efficient plan for retaining day-to-day records, may be set up. Basic factors to be considered in developing a records retention schedule are legal, administrative and historical requirements, and administrative discretion. "How Good Plant Housekeeping Practices Will Increase Production" explains methods to provide a clean condition and to increase production.

Book Review

The Constitutional Diagrams of Alloys: A Bibliography, first edition compiled by J. L. Haughton, second by A. Prince, cloth, 324 pages, published by Institute of Metals, London. Price $5.50 (libraries $4.50, members $3).

The first edition of this book was published in 1942 and has been out of print for a number of years. The volume consists of references to publications that bear on the constitution of binary, ternary and higher alloy systems, arranged in alphabetical order of the chemical symbols of the metals which compose them. Under each system, the references are arranged in chronological order.

In addition to the original references, references to abstracts published by the institute since 1908 are included in a separate column. The new edition contains about twice as many references as the first. The bibliography has been brought up to date to the end of 1954, as comprehensively as possible, and work published in many periodicals through the middle of 1955 has been included.

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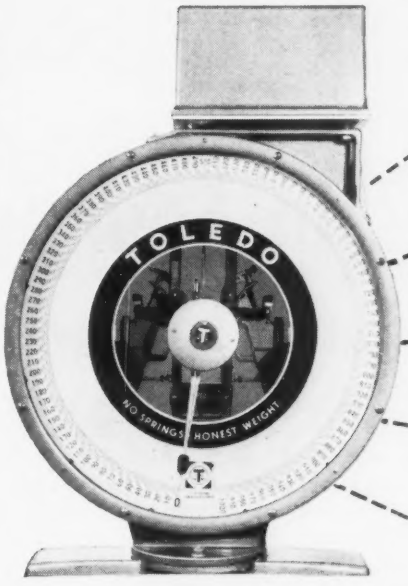

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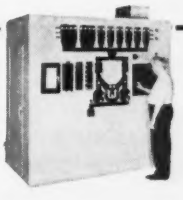
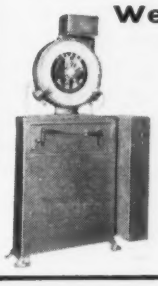
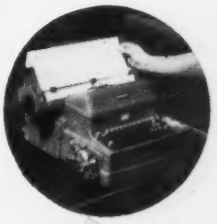


This Toledo cabinet interlocks 22 scales in an automatic batching system.



Through TOLEDOmation all ingredients are fed into successive batches in proper sequence, including operation of gates and feeders. In addition, all dials are automatically scanned and the digital weight data is recorded on an electric typewriter for each batch.



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Trends in Foundry Practice

Discussed at AFS Congress

INTENSE interest of foundrymen in latest developments in foundry practices was evidenced by the well attended technical meetings held during the AFS Congress and Show at Atlantic City. On a number of occasions the seating capacity of meeting rooms was taxed.

To provide Congress visitors more time to inspect the equipment and supplies exhibits, this year's technical program was curtailed somewhat in number of sessions from past schedules. Nevertheless, the approximately 70 papers presented embraced a broad range of subjects.

As would be expected, the shop courses and gray iron and sand sessions were among the most popular. Core blowing, shell molding and carbon-dioxide hardening were featured subjects on the Sand Division's program. Two foreign papers on hot-blast cupola practice were included in the gray iron program. Light metal discussions covered, among various subjects, degassing methods and the progress of research in fluid flow.

Increasing attention being given to working conditions and air pollution was reflected in a larger than usual number of papers on both subjects.

New to the AFS program was a two-session symposium on metallographic practice for both ferrous and nonferrous foundries.

Cupola operation and selection of raw materials were topics of the gray iron shop course. Malleable foundrymen discussed molding methods at their shop course; sand mixtures were the subject at the sand shop courses.

BRASS and BRONZE

AT THREE technical sessions and a roundtable luncheon, brass and bronze foundrymen discussed deoxidation and gas porosity in copper castings, age hardening of copper-titanium alloys, radiography in bronze castings, casting defects and new horizons for brass and bronze foundries.

Fluxing and Deoxidation Treatment for Copper—M. G. Neu, Foundry Services Ltd., Birmingham, England, and J. E. Gotheridge, Foundry Services Inc., Columbus, O. Presented by Mr. Gotheridge. The main foundry problem in making electrical parts is to produce sound castings of good electrical conductivity. Soundness is reduced by 1) shrinkage caused by improper gating and 2) evolution of hydrogen and oxygen which cause casting porosity. Electrical conductivity is reduced by small amounts of added elements in commercially pure copper castings. A good deoxidant, therefore, must not affect conductivity as it removes gas from the metal.

The metal poured into test molds by the authors was deoxidized with phosphorus in the form of 15 per cent phosphor-copper, calcium boride and lithium. Lithium was found to be the most efficient deoxidizer. Only 0.025 per cent lithium removes all oxygen from the melt. Greater additions, however, increase gas content, reducing casting soundness, and the residual lithium reduces electrical conductivity.

A duplex method of deoxidation using 0.15 per cent phosphor-copper followed by an addition of 0.005 per cent lithium produced sound castings with good electrical conductivity at the lowest cost. Residual phosphorus in castings treated by this method was of no consequence and there was no residual lithium.

Discussion—In answer to a question concerning the use of too much lithium, the speaker said that the surplus reacts chemically with water in the air or in the mold material to release hydrogen and thus gas the melt. In answer to another question, it was pointed out that, theoretically, calcium boride should be the best deoxidizing agent. In practice, however, as indicated by these tests, it

An overflow crowd was present at this gray iron shop course session

was determined that it is the least effective deoxidizer, whereas lithium is the best. No explanation has been found for this result.

When questioned about vacuum treatment of metal, the speaker indicated that such treatment does evacuate hydrogen, but copper-oxide remains in the melt. Castings produced from such metal have reduced electrical conductivity because of the oxide-contaminated metal.

Gas Porosity in Oxygen-Free Copper Castings—D. V. Ragone, University of Michigan; J. K. Sprinkle, Virginia Polytechnic Institute, and H. F. Taylor and C. M. Adams, Massachusetts Institute of Technology. Presented by Mr. Ragone. The paper covered a study of gaseous compound formations in pure copper. Tests were conducted in a two-compartment apparatus with atmospheres being controllable in each compartment. Metal was melted in one compartment and poured directly into a mold placed in a lower compartment.

Results indicated that conditions which form gaseous compounds in metal include water in mold materials, oxygen in the melting and pouring atmosphere and carbon such as is picked up in graphite crucibles during melting.

Weak sources of gaseous compound formation were found to be in thoroughly dried molds containing bentonite, silica molding sand, water in the pouring atmosphere, and in the use of lower pouring temperatures because of the reduced carbon solubility encountered.

Age-Hardening Characteristics of a Cast Alloy of Copper-5.8 per cent Titanium—N. P. Hehner, H. McCurdy and R. E. Edelman, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia. Presented by Mr. Hehner. Heat-treated, cast copper-5.8 per cent titanium alloy has tensile properties second to those of beryllium-copper and better than those of commercially used high-strength manganese bronze. The heat treatment necessary to obtain optimum tensile properties for this copper-titanium alloy is to solution treat at 1625°F and age at 800°F. Test castings were held at the aging temperature of 800°F for 72 hr with no noticeable change in physical properties. Average properties obtained on the test castings were 121,000 psi ultimate tensile strength, 107,300 psi yield strength (0.2 per cent offset), 8.0 per cent elongation (2-in. gage length) and 18.0 per cent reduction in area.

Discussion—N. A. Kahn, New York Naval Shipyard, Brooklyn, N. Y., commented that the copper-titanium alloy can be used for parts operating at 200°F higher than parts made of beryllium copper or manganese bronze. He also asked for a discussion of foundry technique used by the authors.

The speaker answered that dross formation was reduced by using a charcoal cover or a flux consisting of 80 per cent calcium fluoride, 10 per cent sodium fluoride and 10 per cent calcium chloride, followed by an addition of 1 per cent manganese to clear the metal. Then the copper-titanium master alloy is added, and as soon as it is in solution, the metal is poured at 2000-2100°F. Fluidity is good, and the melt should not be superheated. A troublesome oxide film develops at the time of pouring and should be skimmed off as the molds are poured. Gating and risering of the castings was in accordance with good aluminum-bronze techniques, and a steel molding sand with low moisture content was used.

The speaker added that work is being continued on melting, fluxing, gating and general foundry handling techniques. It also was pointed out that use of the metal for general foundry work is possible and the forecast made that several foundries will be using the alloy in the near future.

Application of Radiography in Manufacture of Bronze Castings—N. A. Kahn, Solomon Goldspiel and R. R. Waltien, New York Naval Shipyard, Brooklyn. Presented by Mr. Goldspiel. Purpose of the paper was to show applicability and advantages of radiography to foundrymen, inspectors and consumers of brass and bronze castings. Discussion covered gating and risering, evaluation of soundness, inspection, salvage and procurement. Sample radiographs were used to illustrate each section. Use of radiography can bring savings beyond the cost of testing in the design and production of pilot castings. Its use for quality control in the earliest stage of fabrication can weed out defective parts.

It can save castings with defects which would have caused rejection by specifications in effect prior to the

use of radiography. On the other hand, castings with defects too gross to justify repair can be eliminated. Radiography has saved costly replacement of service part failures by providing reliable means of following up defect removal and subsequent checkup of repairs. Its use increases confidence in the judgment of technical people. In procurement, radiography helps in obtaining optimum utilization, availability and agreement on references or standards.

The paper stressed the need for developing radiographic standards for bronze casting alloys if best use of radiography is to be made by brass and bronze foundries.

Discussion—General agreement was expressed for the need of radiographic standards. It was suggested that such standards should include rules for the safe handling of radiographic equipment. It also was pointed out that when radiography becomes a part of procurement standards, its use will gain momentum in bronze foundries.

A word of caution, however, was interjected by one man who emphasized the importance of proper evaluation and interpretation of radiographs. Agreement on interpretation by all concerned is necessary. With an eye to the importance of cost in commercial practice, it was suggested that standards should allow for areas of acceptability for cast parts. In commenting favorably on radiographic inspection, one man stated that it was instrumental in getting the Navy to accept impregnated castings. Previously, castings requiring impregnation were rejected by Navy inspectors.

New Horizons in Copper-Base Alloy Founding was the subject discussed at the brass and bronze roundtable luncheon. Discussion was centered on the CO_2 process and shell molding, and on foundry practices for aluminum, nickel-aluminum and manganese bronzes as well as silicon brass. It was agreed generally that the CO_2 and shell molding processes reduce the manual skills required for producing castings and offer good pattern fidelity. It also was agreed that these processes produce manganese and aluminum bronze castings of better quality than does green sand molding. Furthermore, no pinholes resulting from water vapor are encountered.

In connection with the CO_2 process, it was pointed out that different binders produce sand mixes with different collapsibilities. It is important, therefore, that the proper binder be used for molds and cores. A coating of flake graphite on patterns was suggested as a method of avoiding sticking of the pattern when it is left in the mold during the gassing process. CO_2 molds and cores should be stored in a dry place; otherwise they will pick up moisture from the air. In general, however, they have a better shelf life than oil sand cores.

In formulating sodium-silicate sand mixes for hardening with CO_2, it was suggested that 1 per cent silica flour be added to improve collapsibility and reduce metal penetration.

Tests have indicated that used sodium-silicate bonded sands have a higher pH factor than used green sand. However, that factor apparently has little effect on the reuse of the sand for oil-sand cores or for green-sand molds in steel foundry practice.

With regard to shell molding, several foundrymen commented that they had abandoned the process and gone back to green sand work. By using good patterns, controlled sands, good equipment and good foundry techniques in green sand, they can produce castings as good as those made in shell molds.

Discussion of foundry practice in aluminum bronze and nickel-aluminum bronze centered around the melting of chips and turnings from the machine shop. Several foundrymen commented that they had no difficulty in melting these returns although they contain about 6 per cent moisture in the form of soluble oil and water. The practice is to add the chips to the molten bath and when they are melted to pour off half the bath into ingot molds. Additional chips then are added to the remaining bath.

In commenting on the use of lithium as a deoxidizer, it was emphasized that the amount of addition should be controlled carefully. Residual lithium in the metal affects fluidity adversely.

Three papers were presented at the brass and bronze castings defect clinic. **Defects Due to Melting, Pouring and Solidification**—Robert A. Colton, Federated Metals Division, American Smelting & Refining Co., Newark, N. J. A logical approach to eliminating casting defects depends upon properly recognizing the defect through visual, radiographic, tensile and pressure testing procedures, proper analysis of the defect and instituting corrective procedures.

Many defects can be avoided by melting in a clean crucible; charging only clean, dry metals of known composition; melting quickly in an oxidizing atmosphere; avoiding overheating the melt; using proper deoxidizers and by following good pouring practices.

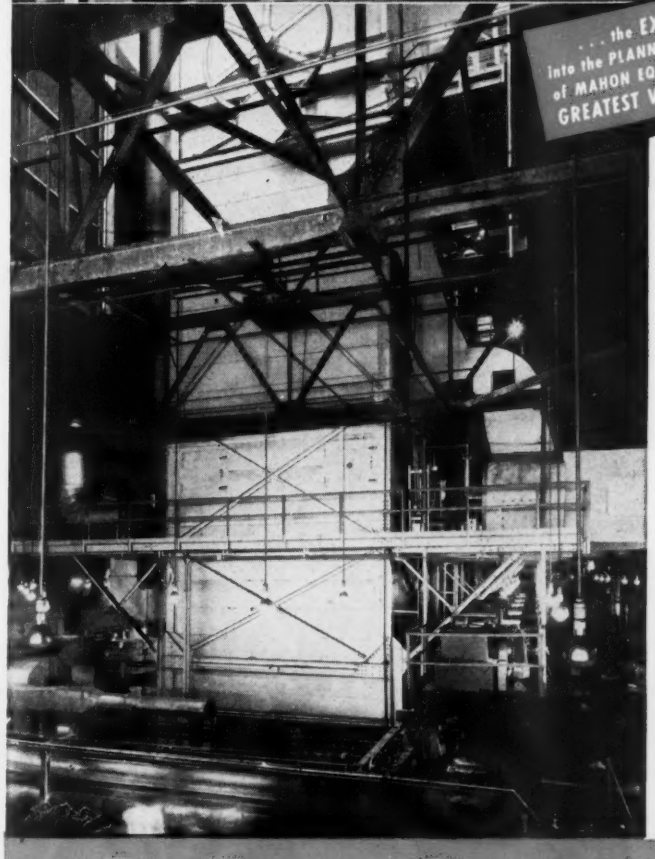
Gating and Risering Defects—Fred Riddell, H. Kramer Co., Chicago. Mr. Riddell showed slides of several castings and commented on various gating and risering methods used to produce the castings.

Defects Due to Sand—George Watson, American Brake Shoe Co., Mahwah, N. J. Molding sands containing balls of clay produce castings with rough surfaces. Clay balls are developed during mulling and handling of sand which contains excessive clay, excessive fines and over 6 per cent moisture. Control of these ingredients will minimize formation of such balls. Screening is the only way of removing them once they are formed.

Penetration into oil-bonded sand is caused by insufficient baking. Undried oil in such sand searches for oxygen and causes a vacuum in the interstices between sand grains and also raises the metal temperature at the mold surface. The combination of high-temperature metal and vacuum forces the metal into the

View shows a part of the audience at one of the gray iron sessions

CORE OVENS...



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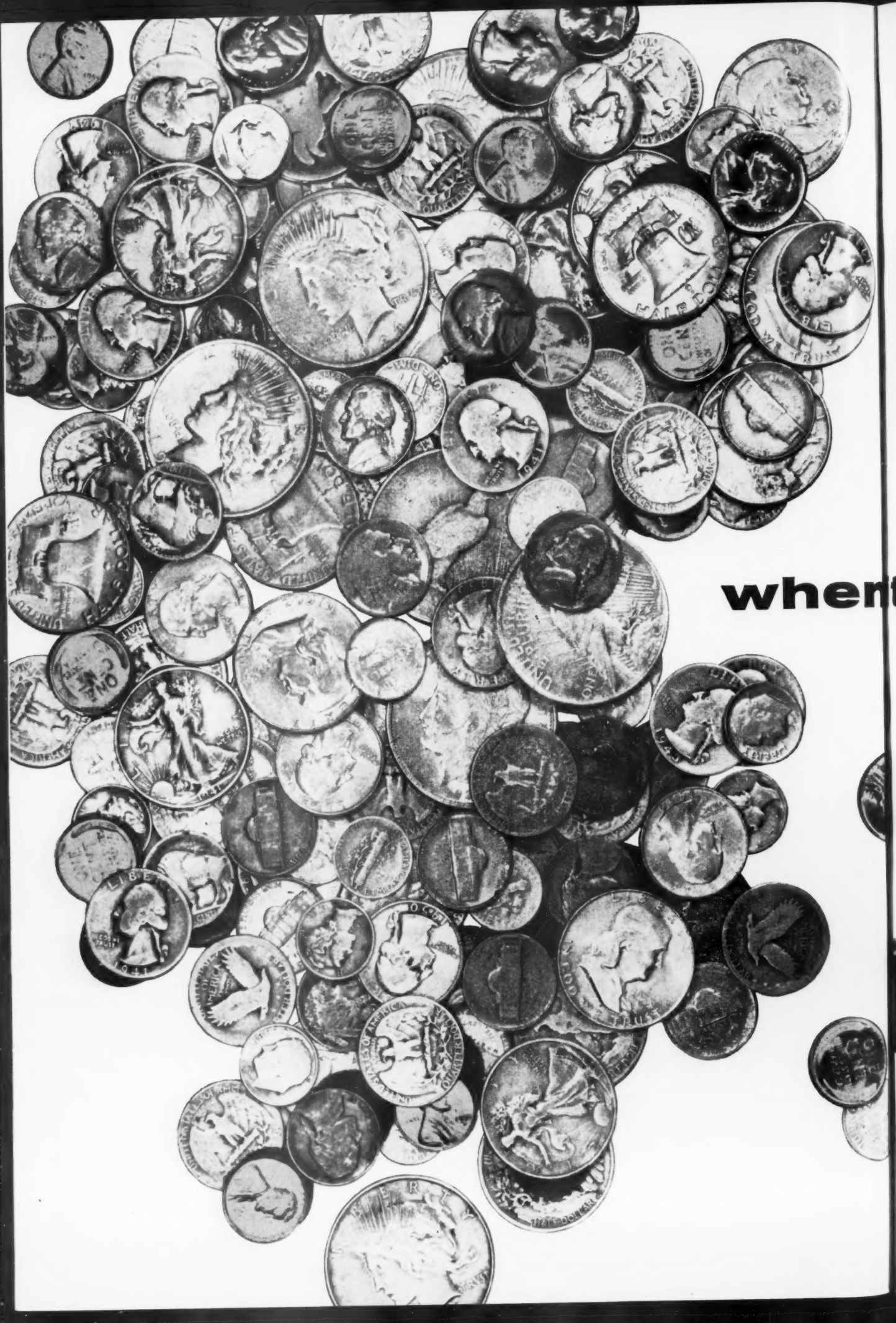
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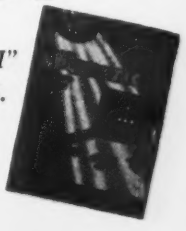

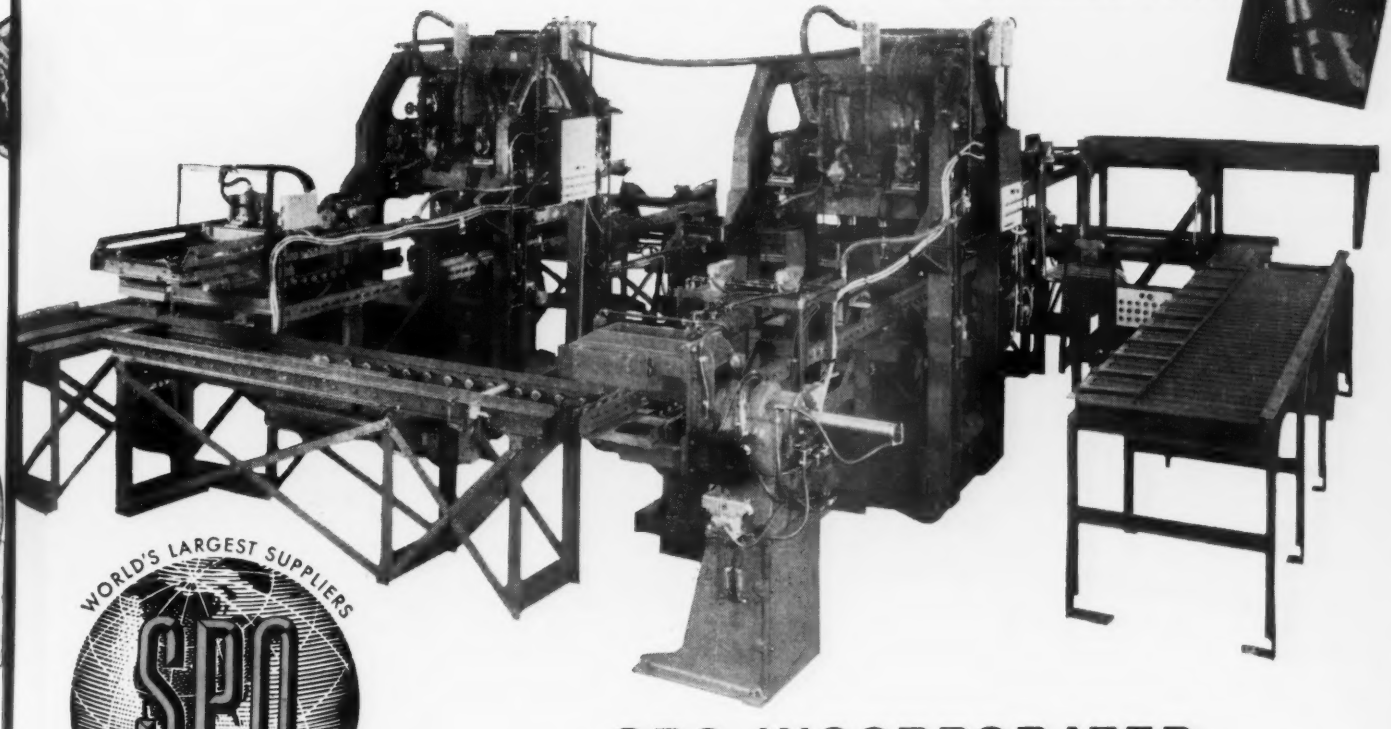

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walls of the cores and molds.

Scabbing on a casting occurs when the mold wall breaks. Such breaks occur when sand expands from heat of the metal. Such expansion is 4 per cent by volume at 2500°F. Mold walls will not break if the hot deformation of the sand mix is great enough to compensate for expansion of the sand. At low and high moisture content, sand expansion will be high. The optimum is in between. High expansion factors also will be found in molds of high density, those which have been rammed hard and those which contain a high percentage of fine sand. Low expansion is typical of low flowability sands.

MALLEABLE IRON

MELTING, annealing and other phases of malleable iron production were considered in two technical sessions, a joint malleable and gray iron roundtable luncheon, and a shop course.

Effects of Charge Proportions, Furnace Atmosphere Flow Rate, and Melt-Down Time on Properties of Malleable Iron—A progress report by the Malleable Research Committee, prepared by A. H. Zrimsek, American Steel Foundries, Chicago, E. H. Belter and R. W. Heine, University of Wisconsin. Presented by Prof. Heine. Experimental heats indicated steel scrap in the charges led to increased oxidation. Gas flow rate has no apparent effect on Si and Mn losses. Rapid melting rate is desirable especially where steel scrap is used since it reduces oxidation of the steel.

Steel in the charge, due to its oxidation, tends indirectly to reduce the index of quality of malleable properties. Indications are that increase in silicon oxidation resulting from oxidation steel in the charge increased first stage graphitization time. Cooling rate for second stage graphitization does not appear to be affected by silicon oxidation. The study indicated the possibility that pig iron may have an important effect, and in the future this aspect may be investigated.

Annealing on Five-Day Week Basis—R. V. Righter, Central Foundry Division, General Motors Corp., Danville, Ill. Advantages of use of bismuth-boron inoculants and high-nitrogen atmosphere in annealing of malleable iron were described. Amounts of Bi range from 0.005 to 0.02 per cent, and B is around 0.003 per cent. They are added in metallic form, supplied in paper envelopes by the laboratory, to the ladle by the pourer. Bi-B inoculation circumvents mottling in sections up to 3 in., and permits a broader range of compositional limits. The latter permits use of less expensive raw materials. Present charges are composed of 55 per cent remelt, 25 per cent steel bundles and 20 per cent steel scrap with some addition of ferrosilicon and ferromanganese.

High-nitrogen annealing furnace atmosphere has reduced decarburization of casting skins to practically nothing. Additionally it permits leaving castings in the annealing kilns for long periods without trouble. Combination of Bi-B additions and high-N furnace atmosphere resulted in decrease in number of kilns required for annealing as well as the time needed for the operation. The former ten kilns operating seven days a week now are supplanted by eight kilns running five days a week to handle the same production. Other benefits include operation of the annealing department on the same schedule as other departments, and elimination of material handling involved in the previous seven-day schedule. Disadvantages of Bi-B addition, other than the cost, are requirement of close control on the additions and the generation of fumes which requires increased ventilation.

Consideration of Factors Governing Selection of Modern Malleable Heat Treating Equipment—Report of the Controlled Annealing Committee. Presented by Lyle Jenkins, Wagner Malleable Iron Co., Decatur, Ill. Report pointed out that selection of equipment was based on quick delivery, elimination of decarburized skin, reduction of handling of materials, five-day basis, efficient costs and uniformity of product. With reference to his own foundry a radiant tube type batch furnace operating on natural gas with stand-by oil for firing was selected for some work.

Tube type furnace permits use of tubes for heating or cooling the furnace load. Space requirements indicated the rail type because it was shorter but had a much wider hearth. Furnace permitted variation of heat treatment as well as load, but is not recommended for air quenching. The firm also uses continuous type furnaces, which possess the advantage of controlled heat zones. Cycles of treatment can be changed to handle either regular or pearlitic malleable.

Furnace atmospheres are high-N type containing about 0.3 to 0.5 per cent each of CO and H, no CO_2, and N remainder which eliminates decarburization. Batch type furnaces and continuous belt type are used for tempering pearlitic malleable, while a continuous belt type is used for oil-hardening pearlitic malleable.

Comparison of Liquid and Air-Quenched Pearlitic Malleable Irons—Report of Pearlitic Malleable Committee. Presented by Prof. R. W. Heine, University of Wisconsin. Data from three producers of air and liquid quenched iron show that reheating, liquid quenching and drawing are successful means of making ASTM 60003 and 80002 grades of pearlitic malleable. Air quenching and drawing are successful for ASTM 60003 and lower yield 53004, 48004 and 45007 grades. Liquid quenching and drawing appears able to produce higher yield strength at given hardness than quenching and drawing.

In the discussion it was mentioned that a cutting speed of 400 fpm is being employed for machining and oil quenched and drawn pearlitic, while some of the same type has been machined at 500 fpm. Oil quenching and drawing gave a more uniform product which provided better machinability. Oil for quenching operation is maintained at 130 to 160° F to prevent cracking trouble, and it is essential to keep decarburized skin at the minimum. Martempering or quenching in an oil or salt bath at 400 to 450° F is common practice to prevent distortion in some types of pearlitic malleable castings.

Report of the Joint AWS-AFS Committee on **Welding Iron Castings** was divided into three sections. **Definitions,** presented by G. A. Meyer Jr., Malleable Founders' Society, Cleveland, stated that reclamation and/or salvage by welding refers to operations before use of the casting; repair refers to operations after the casting has been used. **Specifications for Filler Metal** was presented by H. V. Inskeep, Linde Air Products Co., Newark, N. J. Compositions of coated and uncoated cast iron rods, bronzes, nickel and nickel-copper alloys and brasses were listed. **Test Block for Welding Cast Iron,** presented by Walter W. Edens, Allis-Chalmers Co., Milwaukee, described a cast iron block 1¾ x 6 x 8 in. containing a groove ¾ x 1 x 1½ in. Groove was filled with weld metal and sectioned for visual examination and then subjected to tensile testing.

Nucleation of Graphite During the Decomposition of Cementite—E. G. Haney, Aluminum Co. of America, New Kensington, Pa., and M. F. Hawkes, Naval Ammunition Dept., Oahu, T. H. Presented by Mr. Haney. In this investigation specimens of white cast iron were rolled after

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heating to various temperatures. It was found that the greatest number of graphite nodules was obtained with the lower temperatures, and it is believed that the formation of nodules resulted from residual stresses in the iron. High temperature reduced the stresses and consequently lowered the number of nodules formed.

Malleable Base Spheroidal Iron—F. B. Rote, research director, E. J. Chojnowski, research metallurgist and J. F. Bryce, chief metallurgist, Albion Malleable Co., Albion, Mich. This is a new high-strength alloy (U. S. patent applied for) having graphite in a spheroidal form in a highly stable matrix. Generally, its properties are similar to those developed in conventional pearlitic malleable with certain exceptions, which make it a unique material with considerable potential advantages.

Principal alloy is sulphur, free or combined, added during melting or as a ladle addition. Annealing of the sulphur-stabilized iron is accelerated by concurrent addition of a solid-state graphitizer. As sulphur content is increased above conventional founding levels, the internal graphite structure undergoes gradual transitions from temper carbon to rounded agglomerates, to duplexed spherulitic-temper carbon spheroids, to true spherulitic.

Addition of sulphur stabilizes carbide and permits the production of thick metal sections free of primary graphite. At the sulphur levels required to produce spheroidized graphite, the fluidity of the alloyed iron is considerably greater than an unalloyed base, making pouring of thin metal sections feasible. The alloying elements are low cost and free of explosive reaction during ladle addition. Because sulphur produces a true alloying effect, no loss of effectiveness is encountered while the molten metal is held in the furnace or ladle. Excellent casting surfaces are produced in either green sand or shell molds.

The metal is heat treated by conventional anneal, quench and draw processes. During draw treatments, it exhibits a strong resistance to second-stage graphitization or segregation of carbides. Uniform matrix structures are produced, providing high tensile and yield strength and ductility. Modulus of elasticity is uniformly high at 25 to 27 x 10^6. Machinability is excellent.

PLANT EQUIPMENT

PROGRAM of the Plant and Plant Equipment Committee included one individual session and one joint session each with the Air Pollution Control Committee and the Gray Iron Division. Among the topics covered were the use of pulverized coal with oil as fuel, development of the coreless line frequency induction melting furnace, cupola control equipment and shell molding equipment.

Melting Malleable Iron with Pulverized Coal and Oil as Fuel—E. H. Nielsen, Whiting Corp., Harvey, Ill. When used to melt iron, oil has a tendency to cause oxidation. Use of pulverized coal with oil makes possible a controlled atmosphere because of the presence of carbon. Temperatures are high, oxidation is decreased and more metal can be melted in less time. These advantages produce the following results: Less scrap, higher yield of good castings, no loss of proper elements, better fluidity and hotter metal. Proper design of the melting unit aids attainment of these results.

In discussion, C. O. Schopp, Link-Belt Co., Indianapolis, asked whether Mr. Nielsen had any comment on carbon control by varying the oil-coal combination. The author stated that the goal always is to keep the carbon as close to optimum as possible. Since carbon tends to be higher in the morning, the oil is turned on then. When the carbon comes down, the coal is turned on. In response to another question, Mr. Nielson replied that oil alone will yield a higher temperature than coal alone. He cited, however, the example of a foundry using the combination which stepped up the output of its furnace from 75 to 125 tons without refractory damage.

Recent Development of Coreless Line Frequency Induction Melting Furnace in Eureopean Foundries — Otto Junker, Otto Junker GMBH, Lammersdorf, Aachen, Germany. Presented by Manuel Tama, Ajax Engineering Corp., Trenton, N. J. Still not well known in the United States, the coreless line frequency induction furnace operates on the principle of an air core transformer without a closed iron coupling. Its main characteristic is a simple melting chamber of cylindrical shape which resembles a conventional crucible. It has no melting channels or loops and can be adapted to intermittent operation since no molten metal heel must remain in the furnace.

Alloy changes are made easily. Melting losses are low, no fluxing is required and chips and turnings can be charged without briquetting. Bath circulation is strong, but does not harm refractory lining unduly. Capacities should be at least 1200 lb for ferrous metals and 800 lb for others.

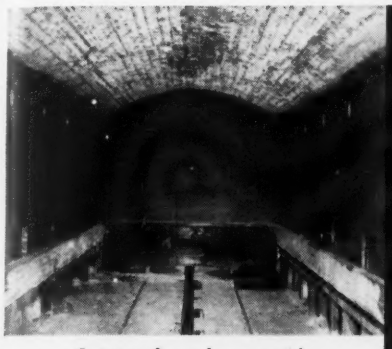
In the discussion it was stated that the furnace operates at about 80 per cent efficiency since 18 to 23 per cent of the heat is lost in water cooling of the coils. Where power companies object to too high a load on single-phase furnaces, a phase-balancing accessory is available which costs 15 to 20 per cent more and raises power consumption 2 to 3 per cent. The furnace was not designed to melt 85-5-5-5 bronze, but many companies now are ordering it for that use.

Available Control Equipment for the Foundry Cupola and Their Performance, Operation and System Characteristics — John M. Kane, American Air Filter Co., Louisville. This session combined plant, plant equipment and air pollution discussions. After pointing out that emissions from cupola stacks consist essentially of cinders, dust, smoke and fumes, and that the amounts of each vary widely from cupola to cupola, simple and complicated systems were described with their advantages and disadvantages. The wet cap type removes particles down to 44 microns, the low-pressure drop centrifugals down to 30 microns, high-efficiency centrifugals down to 7 microns, wet collectors down to 1 micron in size, while electrostatic precipitators and bag type filters remove particles down to 0.1 micron.

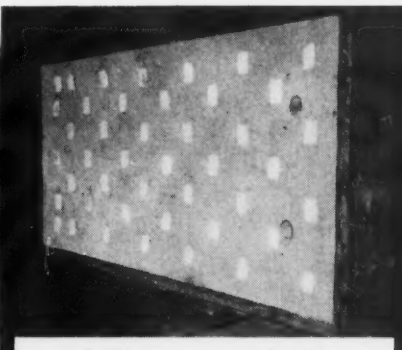
Control of Make-Up Air in Industrial Plants—K. E. Robinson, General Motors Corp., Detroit. Slide demonstration session. Introduction of outside air into plants to eliminate troubles from heating and cooling was demonstrated. Usually the air is brought in to about 8 feet above the floor level and distributed horizontally at low velocity. In winter the air is heated. Where radiant heat is involved, the only suitable method of cooling is by shielding the source to eliminate spreading into the surrounding area.

Casting Tolerances as Affected by Automation in the Machine Shop—E. L. Buchman, manager, quality control department, Cleveland Foundry, Ford Motor Co., Berea, O. Automation in machining operations means that the foundry must have better planning, closer control of its

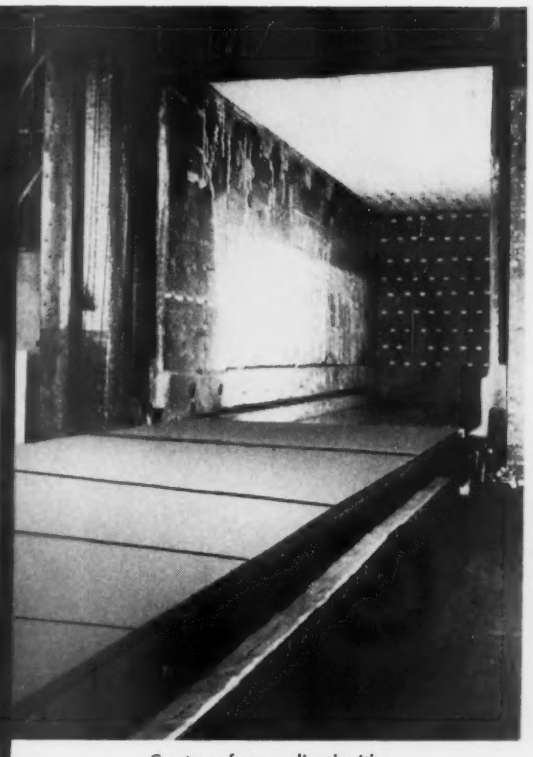
Profitable trends in the use of refractories



Car-type forge furnace with Laclede castable refractory walls

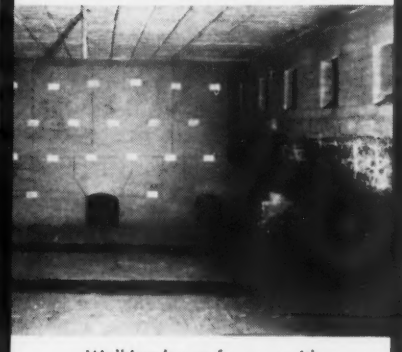


Soaking pit cover made with Laclede Plastic refractory



Car-type furnace lined with Laclede Castable and Plastic Refractories

Batch-type reheating furnace lined with Laclede Castable



Walking beam furnace with Laclede Plastic side and end walls

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processes and better than average inspection of castings.

Accurate dimensions are mandatory, partly because allowable tolerances have diminished to where the commercial casting of yesterday is not suitable today. Cored areas must be true and free of defects since in some cases all machining starts from a cored hole or a cored surface. For instance, the location for the first machining of one cylinder block is taken from two cored holes on the head deck. A shift in the jacket core would make all subsequent machining incorrect, and taking too heavy a cut might tear out a single or an entire bank of tools. In other cases, the casting may become jammed in the automation, resulting is a complete shutdown of production.

Close control of metal is important to provide uniformly good machinability. Where in the past a hard spot in a casting might ruin a cutter on one of several machines, today it could mean that a whole broach section would go down with hundreds of tools to be changed. Cleaning operations must remove fins and flash which might cause trouble because of the close clearances in the automatic transferring of castings from station to station and in their positioning at various machining operations.

Blow-Hot Press Automatic Shell Molding Machine—R. S. Amala, J. H. Smith, A. L. Boegehold and R. F. Thomson, General Motors Corp., Detroit. Presented by Mr. Amala. This machine, developed jointly by the Central Foundry Division and research staff of GMC, employs a blowing process to form large shell molds and a hot press process for curing them.

Advantages of the machine include a rapid production cycle—one to three seconds for the blow and 12 to 25 seconds for curing. Casting dimensional qualities have been improved. Thinner shell molds, resulting in decreased resin cost, are possible because of the uniformity of shell thickness produced by the blowing and hot pressing. Steps in the machine's operation include:

1. The heated pattern is placed below a blow-head with a pattern-matching contour.

2. A resin-sand mixture is blown into the cavity between the pattern and blow-head.

3. The pattern and adhering sand-resin are retracted and moved into contact with a heated contour head where 300 psi pressure is applied to facilitate curing.

4. After curing, the pattern and shell are retracted from the press-head and the shell mold is stripped from the pattern.

5. The pattern is returned to the blow station to repeat the cycle.

This type of machine is used by Central Foundry to produce camshafts, four to a mold, at a rate of 40 to 50 molds per hour. It is also used to cast rocker arms, and experimentally has produced shells for automotive crankshafts and fractional horsepower motor end frames. Since it requires auxiliary contoured blow and press heads, it is best adapted to large volume production and to patterns whose geometry is generally flat or moderately contoured.

Discussion — Difficulties from thermal shock—mold cracking on pouring—were said to be overcome by using a sand mix which the authors describe as a semicoated type. This type is an intimate mix of sand, resin and a liquid ingredient which holds the resin particles close to the sand but does not dissolve them. While not as strong as a fully coated sand, this type is dust-free and blowable.

Shells are blown at 80-lb air pressure. The pattern plate is cast iron and is bolted to the aluminum heater platen. About one-half hour is required when starting production to bring the pattern and press-head to operating temperature of 500 to 600°F. Speed in curing is ascribed to the close contact of the press-head with the shell. Best results have been obtained with a 300-lb pressure on the head, although higher pressures have resulted in greater tensile strength of the shell.

INDUSTRIAL ENGINEERING

TWO technical sessions and a roundtable luncheon were sponsored by the Industrial Engineering and Cost Committee. Subjects dealt with statistical quality control as applied to the foundry, engineering and costs as related to castings quality, incentives in small jobbing shops and the human factor in new equipment.

Practical Foundry Application of Statistical Quality Control — Ross Martin Jr., plant manager, Rich Mfg. Co. of California, Los Angeles. Statistical quality control is a method or tool whereby a yardstick is established to measure the variability of a process or part. Everything in nature or made by man or machine varies. No two items are exactly alike if sufficiently precise measuring instruments are used.

By proper application of statistical quality control it is possible to know how much variation to expect, then corrective action can be taken when the normal or expected variation has been exceeded. Details were not discussed since this information is available in several books — an excellent one being *AFS Statistical Quality Control for Foundries.*

Among foundry operations to which statistical quality control can be applied advantageously are cupola melting, nonferrous melting, scrap production, casting weights, accident prevention, absenteeism, costs, sand control, tool wear and replacement, and many others.

A warning is that over-control can be as costly as under-control. Making changes while still within control limits actually creates a variation which one is seeking to eliminate. Statistical quality control is not something the foundryman should consider if he can afford to use it—the question is, can he afford not to use it?

Engineering, Cost and Quality—J. M. Barrabee, International Harvester Co., Milwaukee. There is a need for better engineering, better quality and better costs in castings production. On prints supplied by the customer, the foundryman needs information that tells what is wanted from the castings in service, finish and tolerances required, etc. Tolerances often are inconsistent with the process by which the castings are made. The castings maker should know machine capability when the customer gets the castings in his plant and he also must know the tolerances that he can hold in his own plant.

Some shops have the commendable practice whereby coreboxes must be checked and given necessary maintenance before they are stored following a production run. Thus they are ready for use at the start of the next run. It was emphasized that quality can not be put into castings in the finishing room. Quality must have been put into them during the production processes.

Basic Cost Concepts for the Small-Medium Foundry — A. C. Sinnett, Terre Haute Malleable & Mfg. Co., Terre Haute, Ind. No two foundries

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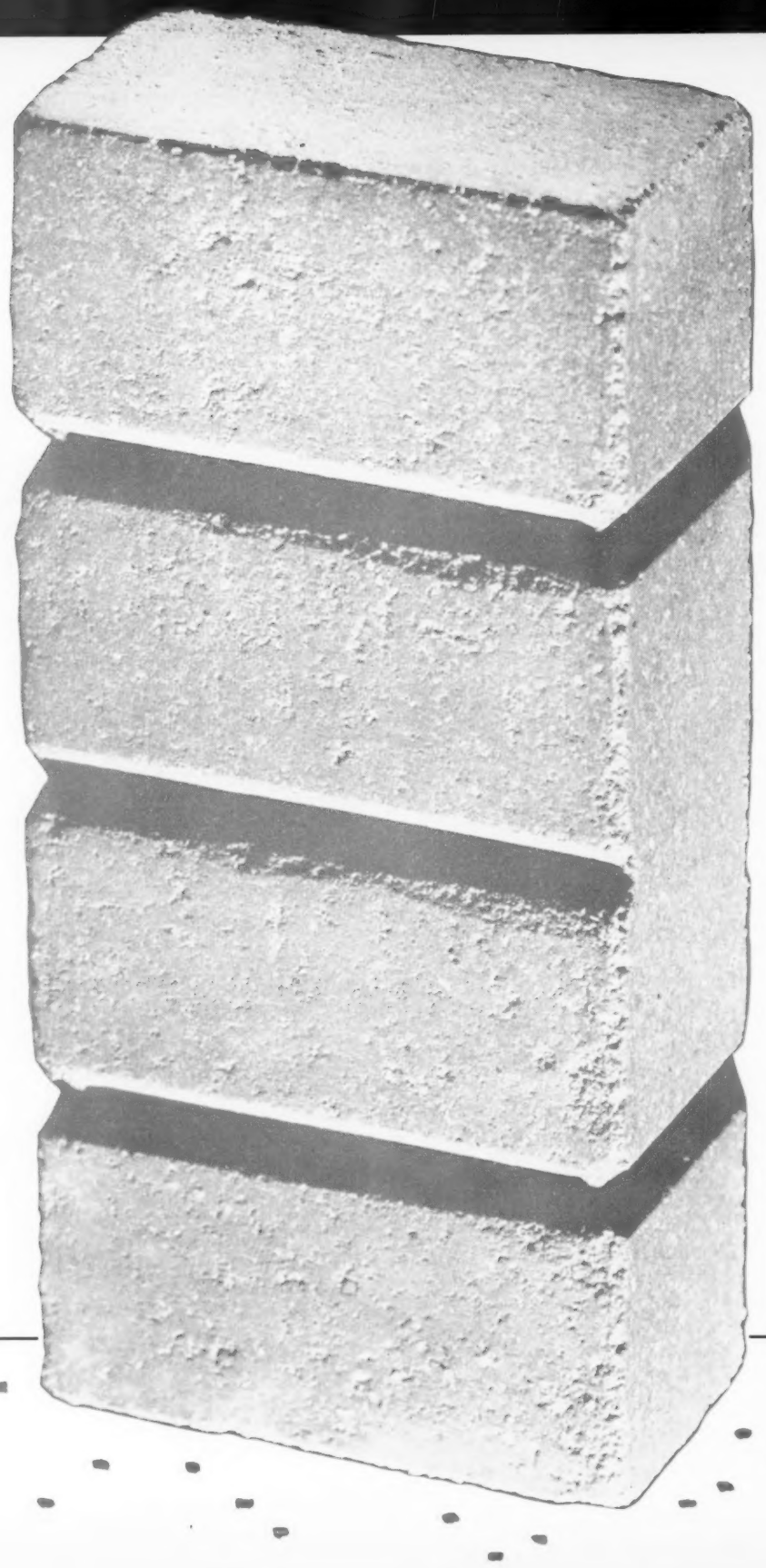

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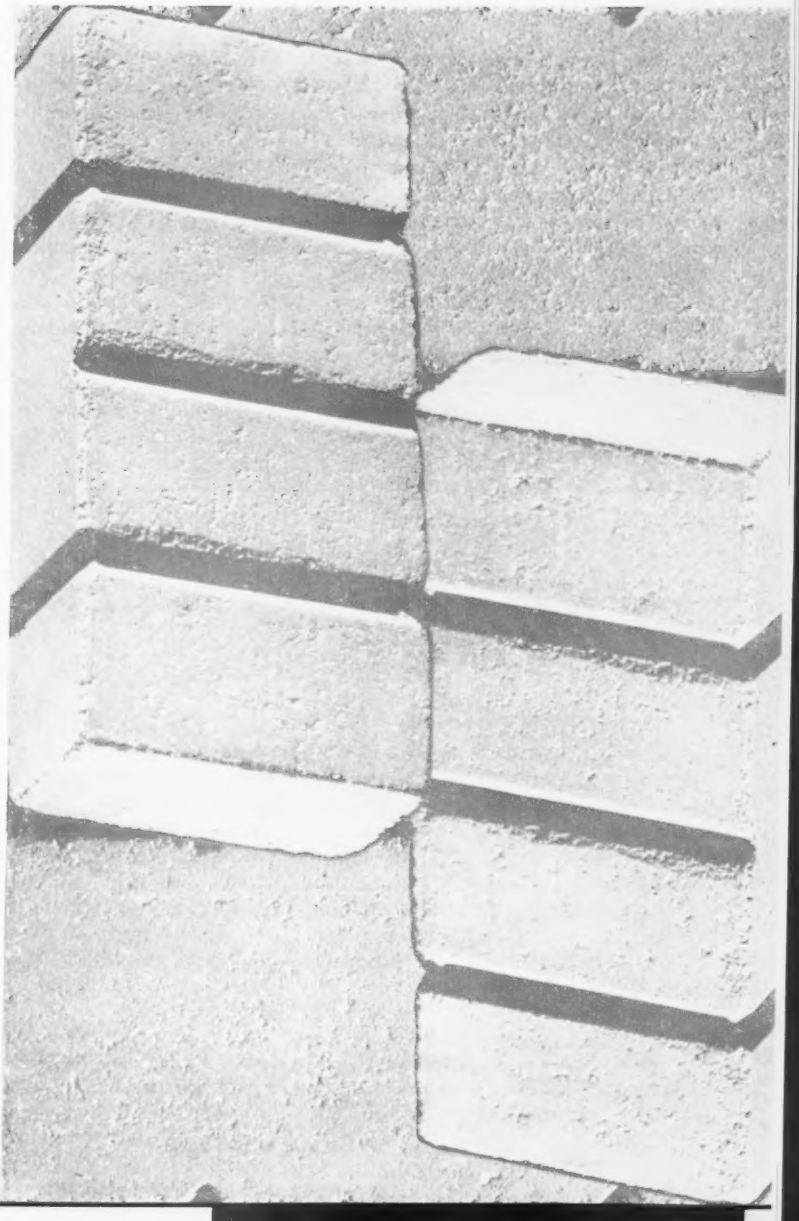

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are alike and every cost procedure must be tailor-made to fit a particular operation. End result of a cost system should be a formula that will develop a cost, per unit of weight or per piece, of a casting from an individual pattern that will reflect a sound basis for determining its selling price. To accomplish this it is necessary to know the cost activities required to produce the casting and the cost of each activity.

Incentives in a Small Jobbing Foundry—Chris C. Erhart Jr., Chris Erhart Foundry & Machine Co., Cincinnati. Presented by J. A. Westover, Westover Engineers, Milwaukee. Report on a jobbing foundry employing 65-75 men, producing soft gray iron, nodular and semisteel castings and averaging 1500-2000 pattern changes monthly. An incentive system was installed in 1952 that has reduced labor costs 25-30 per cent while increasing production per man. Selling prices are now established on a more reliable basis than before, resulting in increased customer satisfaction. New equipment was purchased where needed and new procedures established where time and motion studies indicated they were necessary. System has taken guesswork out of the operation and provided management with an effective tool for a more efficient operation and maximum savings potential.

Discussion—Each individual keeps his own records. Small errors do occur but not enough to offset salary of a full-time checker. About 75 per cent of employees are on incentives as individuals or part of a group. Others are on day work. Some problems are involved in initial establishment of the system, an educational program on part of management and labor being required. There is a definite danger in establishing incentives before a method study is made. Methods study should be a never-ending proposition and should be under continual review.

Human Factor in New Equipment—John Taylor, Norris & Elliott Inc., Columbus, O. Critical analysis of the failure of management (in many instances) to consult with and sell supervisory employees on the merits of a new piece of equipment. Human element is too often overlooked. Management should realize that maximum results are obtained from equipment only when operating personnel and their supervisors fully understand and favor a unit of equipment. Full recognition must be given to the degree of responsibility entrusted to the supervisor. Management should also be aware that some of the greatest savings are often made in the most unexpected places through a company's most valuable asset—its employees.

EDUCATION

A ROUNDTABLE luncheon opened the program of the Education Division which included two other sessions—one devoted to training needs of the industry, the other to chapter educational activities.

Tomorrow's Foundryman—L. J. Fletcher, vice president, Caterpillar Tractor Co., Peoria, Ill. Tomorrow's foundryman will be highly skilled in handling both metals and men. He will advance far in foundry theory and practice. Apprentice training in the pattern shop and foundry will continue to expand and reflect the growing complexities of foundry practices.

Men especially trained in our engineering colleges will make greater and greater contributions but, as in the past, men who start with a shovel in their hand and determination to advance in knowledge will continue to rise and reach the top.

Tomorrow's challenge to the foundryman will call for more than familiarity with metals. He must equip himself to deal in other fields of equal importance. All industrial production comes from the effective cooperation of many people who know the importance of their particular job and the reasons why they best serve themselves when these jobs are well done.

Tomorrow's foundry manager must know and impart understandingly to all the people of his organization how the business life of this nation operates. Also he will implant in his employees and associates the desire and willingness to become active in the political life of his or her community—such as serving as a school board member, councilman, precinct committeeman, etc. We must get into this act or not complain if we dislike the way things are run.

Foundry Training Needs—John S. McCauley, research director, U. S. Department of Labor, analyzed the department's report, prepared in cooperation with foundry industry representatives, concerning manpower developments in 41 highly mechanized small and large foundries suggested by an industrial committee.

Plants estimated an over-all employment increase of 19.5 per cent in various occupations by 1960. Patternmakers, maintenance mechanics and electricians (service group) will increase considerably more than total employment. Molders, coremakers, melters, chippers, etc. (operating group) are expected to gain slightly less than over-all employment. Technicians and administrative personnel will increase sharply, while engineers will increase only slightly more than total employment. During the last four years, with a 1.4 per cent increase in employment, a gain of 10.2 per cent was reported for the service group occupations. Operating groups showed a slight decline. Number of engineers increased more rapidly than technicians.

Discussion—There is need for a clarification of titles in levels of employment. Many engineers do the work of technicians, especially in small foundries. Patternmakers spend time on repair of patterns which could be done by maintenance men without wide patternmaking experience. Industry must find a source of technicians one or two years beyond high school, trained to assist in these duties, and methods must be found for training more technicians.

Young men should be encouraged to enter the industry, and high school courses should include mathematics and science to meet college requirements. Credit should be given in trade schools for apprentice training upon completion of courses. Foundries should be urged to give summer work to students to interest them in future foundry careers. No matter what training schools and colleges give, we have to get men into foundries and train them in foundry methods. Industry should be willing to supply equipment in schools and colleges to give students practical foundry training.

Chapter Educational Activities—Harry E. Gravlin, Claude B. Schneible Co., Detroit. Activities of AFS chapters are wholly educational except for a few social affairs. Chapter educational activities are directed to the public, members, institutional programs and inter-chapter programs. Attitudes of chapter members affect the success of educational efforts in those four areas. Panel speakers offered suggestions for effective work in the four educational activities.

Public Education—Robert H. Herrmann, FOUNDRY. Newspapers, magazines, public displays, radio and television will give space and time to foundry publicity material if it has interest for a large enough segment of the public. News about well-known people, unusual events and new and

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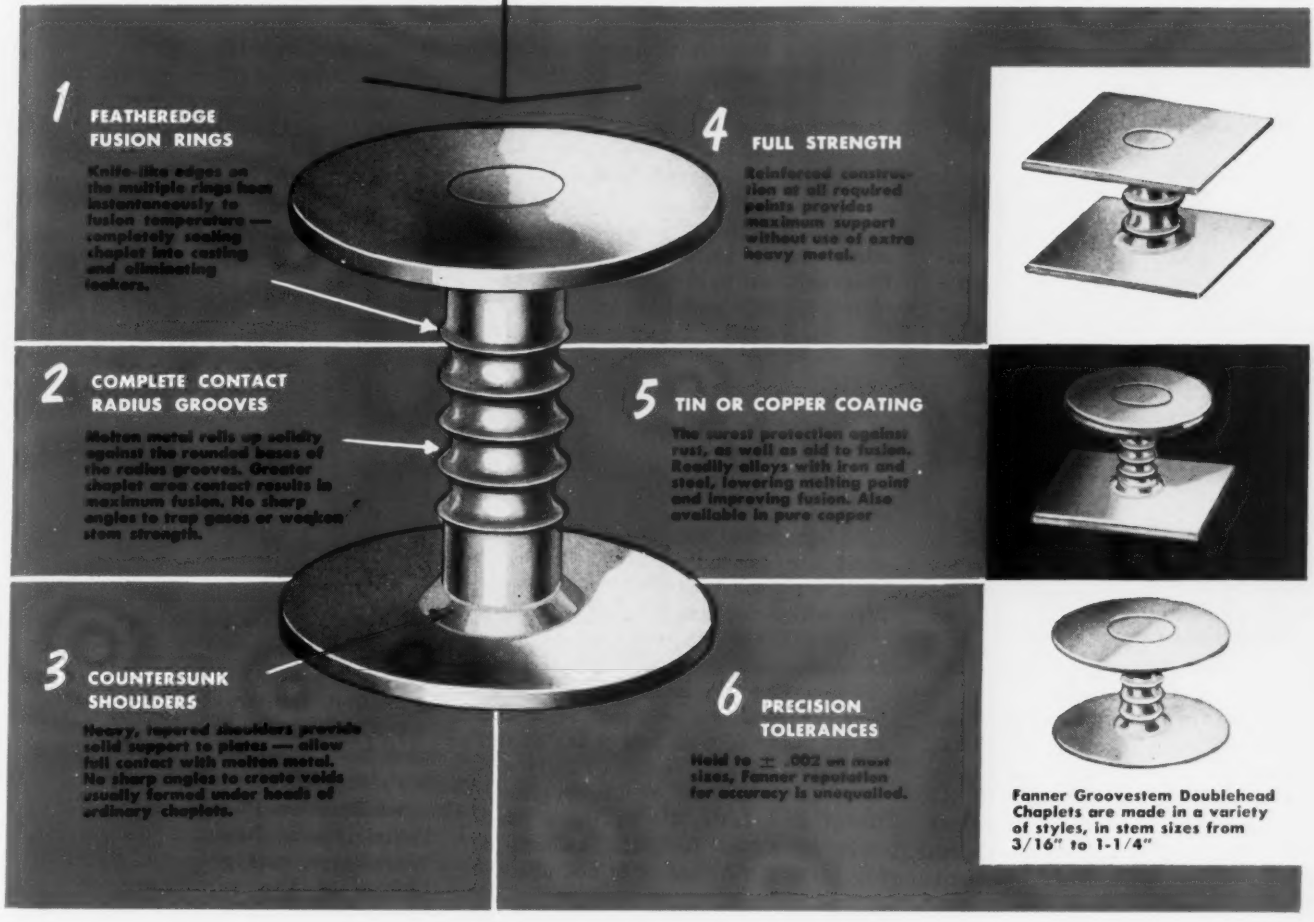
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different processes has sufficient interest. Items submitted for use by the various publicity channels should contain those elements of interest.

Member Education — Morris McQuiggan, LaSalle Coke Co., Montreal. A course of 40 lectures on foundry practice based on an original course developed by the educational committee of Ontario Chapter, AFS, was presented by the Eastern Canada Chapter. Two-hour class sessions were held one night a week. Registration fee was $10. The course is designed for young men working in foundries and had excellent response. Those who attended found the subject matter educational and useful. Foundry managers also were enthusiastic.

Institutional Programs—J. A. Barrett, National Malleable & Steel Castings Co., Indianapolis. A private committee of foundrymen studied foundry practice classes at two Indianapolis high schools and started a program to arouse interest in such courses. Plant tours were held, foundry movies shown and question-and-answer sessions were held for student groups. Necessary foundry equipment for classroom use was recommended to superintendents of the schools, and the committee helped raise money to buy some of the equipment. The program was successful and many students now take foundry courses in well-equipped school shops.

Inter-Chapter Programs—R. W. Schroeder, University of Illinois, Navy Pier Branch, Chicago. The national AFS office should maintain a central clearing committee through which ideas submitted by individual chapters can be accumulated and submitted to all chapters for use. Educational efforts should be directed to boys in 6th, 7th and 8th grade school levels to be most effective. Programs can be developed in schools, church groups and boys groups.

HEAT TRANSFER

FIVE PAPERS were presented at two sessions sponsored by the Heat Transfer Committee. Subjects discussed included temperature drop in ladles, risering of nodular iron, heat flow, solidification phenomena and heat treating fundamentals.

Temperature Drop in Pouring Ladles—Dr. Victor Paschkis, Columbia University, New York. This report was based on an AFS-sponsored research project conducted by the Heat Transfer Committee. Tests were conducted on two ladle sizes: 150-lb capacity with 1 and 3-in. linings and 16,000-lb capacity with 6 and 10-in. linings. Shell thicknesses were ⅛ and 5/16-in., respectively. Some of the conclusions reached were:

1. Proper preheating of the ladle to a given inside temperature can be considered complete only when the lining is fully soaked with heat; this condition is reached when the outside temperature stops rising.

2. A considerable part of the heat losses occurs from the top of the ladle. Some kind of protection against heat loss is necessary, such as use of a lid.

3. The higher the preheat temperature of the ladle, the more important is the use of a lid. Without a lid, the losses vary directly with the time; with a lid, the losses from the top change very little with time.

4. Preheating the lid does not seem important; it increases the radiation loss while decreasing heat storage in the lid.

5. Increasing lining thickness beyond 1 in. for ladles of 150 lb, or beyond 6 in. for loads of 16,000 lb has little effect on temperature loss. This is particularly true of preheat temperatures not exceeding 2100°F.

Discussion—In answer to a question, Dr. Paschkis said that reference in the paper to heat loss of the metal, as shown in Figs. 8-11, actually applied to heat loss of the system—metal and ladle. C. E. Sims, Battelle Memorial Institute, Columbus, O., pointed out that it is not uncommon for temperature of metal pouring from a ladle to show an increase after a large casting has been poured. The reason is that the coldest metal, generally located at the bottom and sides of a ladle, is flushed out after a long pour; subsequent pours, therefore, are of hotter metal.

Risering of Nodular Iron—R. C. Shnay and S. L. Gertsman, Department of Mines and Technical Surveys, Ottawa, Ont., Canada. Presented by Mr. Shnay. This report covered a study to determine the effect of pouring temperature on the shrink depth of nodular iron risers. Castings were poured in green sand and dry sand molds of metal tapped from an induction furnace at 2640°F. Poured at 2 to 4-minute intervals, the metal temperature difference between molds was 35°. The castings were cylinders 3½ in. in diam, 3½ in. thick with a 4½-in.-diam riser. Rice hulls were used as insulation on top of the risers in one-half of the cases.

Aside from demonstrating the already known fact that insulation increases the effectiveness of a riser, these tests indicated that 1) riser shrinkage of hypereutectic iron varies materially with pouring temperature, 2) hypoeutectic iron shows little variation with temperature, and 3) microstructure changes with temperature. It was suggested that possibly the holding time between pours, rather than the actual difference in temperature, may be responsible for the differences in microstructure because magnesium content supposedly drops as the metal is held.

Transient Heat Flow, by Dr. Victor Paschkis, pointed out that foundry work is based on heat transfer of transient nature rather than steady-state, and then explained by definitions and diagrams the various factors involved. Briefly one might consider a wall or slab divided into a number of layers, with a source of heat supplied to one face. Greatest part of the heat received in each layer is stored to raise its temperature and a smaller part of the heat passed on to the next. As the temperature of each layer increases, less heat is stored and more passed on, and in time the steady-state condition prevails.

Discussion—It was brought out that little if any benefit was secured with a chill to casting section thickness of more than 1:1 ratio. Presence of an air gap between casting and mold has a noticeable effect on heat extraction. Corners freeze faster because more sand is available to extract heat. Moist sand provides better heat transfer than dry sand.

Solidification Phenomena, by W. S. Pellini, Naval Research Laboratory, Washington, was presented by H. F. Bishop of the same organization. These phenomena include such factors as heat diffusivity of the mold, solidification range and thermal conductivity of the metal or alloy. When mold heat diffusivity is high, a greater temperature differential is created between casting and mold. When solidification range is wide, more difficulty is encountered in feeding than when the range is narrow. Low thermal conductivity of the metal leads to progressive solidification.

Some of the characteristics can be changed easily. Chilling by increasing the rate of solidification of alloys with a wide solidification range promotes sounder castings. Long-solidification-range alloys require larger risers than do short-solidification-range alloys. Better feeding is secured with eutectic alloys since there is an abrupt change from liquid to solid state and no formation of dendrites to hinder feeding.

In the discussion it was pointed out

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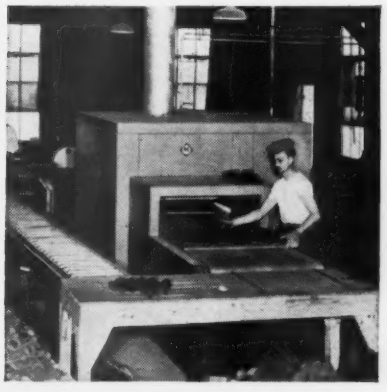

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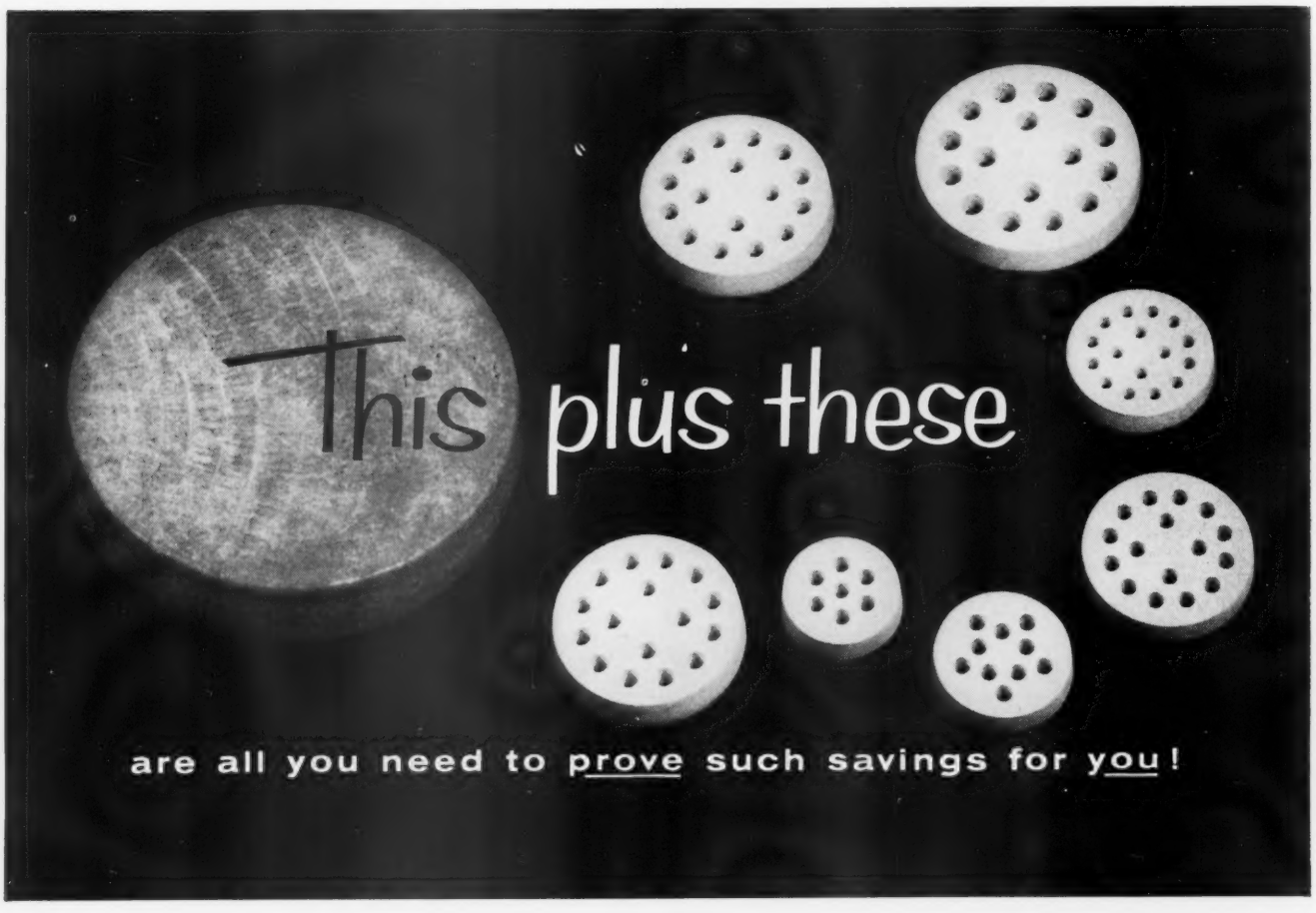

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that use of chills tends to cause cracking in steel castings, and the remedy is to decrease the usual 1:1 ratio or interpose a layer of sand between casting and chill.

Heat Treating Fundamentals, by W. J. Childs, Lafayette College, Easton, Pa., simply involved getting heat into and out of the material at the proper times; but it is complicated by factors such as fuel economy, costs, scaling, heat flow in the furnace, etc. Since high temperatures provide high heating rates, it always is advisable to use the highest possible considering the desired end result.

In the discussion it was brought out that the temperature differential between interior and exterior of a casting at a given temperature is of a low order, and that the commonly used rule for heat treating—holding for 1 hour per inch of section thickness—is out-moded. However, some work has to be done to determine a more realistic holding time.

REFRACTORIES

TWO papers were presented at the one session sponsored by the Refractories Committee.

**Properties of Refractories Affect Air Furnace Bottom Service—L. R. Jenkins, Wagner Malleable Iron Co., Decatur, Ill. A chart was shown listing ASTM specifications of a number of refractories used for air furnace bottom linings and the service life each had provided. It was found that a 60 per cent alumina brick of high purity provided the most consistent results and actually was better than the 80 per cent alumina brick of lower purity.

Standard 9-in. brick is used, and it is the practice at Wagner to dip all contacting edges of the brick in a sillimanite cream and to complete the job by brushing the top with a sillimanite wash. The custom of sweeping sand over the surface has been discontinued. It was suggested that to extend the service life of an air furnace lining, avoid superheating the metal, use a minimum amount of coal and empty the furnace within two hours after the cupola is shut down.

**Experience with Basic Cupola Refractories and Melting—A. P. Alexander and Edward Boywid, International Harvester Co., Memphis, Tenn. Presented by Mr. Alexander.

The cupola described is a 9½ Whiting used on alternate days under a mechanized shop production schedule. Iron melted is poured as gray iron or inoculated for nodular iron. Changes to the cupola were made in small stages as the cupola maintained its operating schedule. Basic lining was first added to the melting zone. Because it was found difficult to maintain the proper depth of slag and not have it blow out through the tap hole, the cupola was converted from back slagging to a front slagging operation. To provide greater penetration of the blast and improve melting, the tuyeres were restricted.

Further alterations included water cooling in the melting zone and carbon blocks as refractory in the tuyere area. The cupola melts all-steel scrap. Carbon pickup improves with blast weight of 480 lb/min. Water cooling has cut the cost of refractories from $2.40 to 89 cents per ton of metal, and this cost is still dropping. Cupola is working so efficiently that it now is operated daily.

GRAY IRON

IN FOUR technical sessions, a joint roundtable luncheon with the Malleable Division and a joint session with the Plant and Plant Equipment Committee, gray iron foundrymen discussed structure and heat treatment, service and life of gray iron castings; cupola melting practice, coke and pig iron properties, shell molding, casting tolerances; and malleable base spheroidal iron.

**Service Life of Iron Castings Can Be Affected by Their Thermal Conductivity—J. A. Davis, H. W. Deem and H. W. Lownie Jr., Battelle Memorial Institute, Columbus, O. Presented by Mr. Davis. Thermal conductivity can have a major influence on performance of a casting in service. Differences in thermal conductivities of irons may affect design specifications in many applications involving heat transfer.

Quantitative data are given on the coefficient of thermal conductivity of five irons between 150 and 600°F. If thermal conductivity of common unalloyed flake-type pearlitic iron at 200°F is taken as 100 per cent, then alloyed flake type irons at 200°F have thermal conductivities of about 65 per cent, and an alloyed nodular pearlitic iron has a thermal conductivity of less than 50 per cent.

By intelligent use of the higher strength of alloyed irons and nodular irons, it is possible sometimes to reduce casting wall thickness. Use of the thinner wall will tend to offset effect of the lower thermal conductivity of these irons. Often, however, use of the thinner wall will nullify advantages of using the stronger iron in the first place. Experience shows that when an application involves transfer of heat through an iron casting, the thermal conductivity of the iron must be considered. This is particularly true when a change in specification is being made to call for use of a stronger iron or a more heavily alloyed iron.

**Stress-Strain Relationship for Gray Iron—E. M. Stein, Battelle Memorial Institute, Columbus, O. Modulus of elasticity is the straight line portion of the stress-strain curve. Some 200 specimens of low-strength and medium strength gray irons were examined. In applying the stress, the specimen was unloaded before the next higher load was applied. No straight line curves were obtained; this indicates there is no true modulus of elasticity for gray iron.

The curves obtained, however, are useful for comparing stiffness of the various irons. It is obvious that gray iron castings can not be designed on a straight-line stress-strain basis. It is necessary to know the stress to which the casting is to be subjected in service.

Discussion — A question as to whether data obtained in test bar examination can be utilized in designing a specific casting developed a negative answer. Castings of varying designs should be tested for their stress carrying ability.

**Cracking and Life of Ingot Molds—J. Duflot, Institut de Recherches de Siderugie, St. Germain-en-Laye, France. Presented by E. Spire, E. Spire Co., consulting metallurgists, Montreal, Que. Life of ingot molds appears to depend on stress distribution and physical properties of the gray iron material. Considered in the investigation were 12-ton molds. Common damage is burning and fire cracking.

Occasionally molds are too heavy, retarding cooling of the molten steel. Other possible causes for mold dam-

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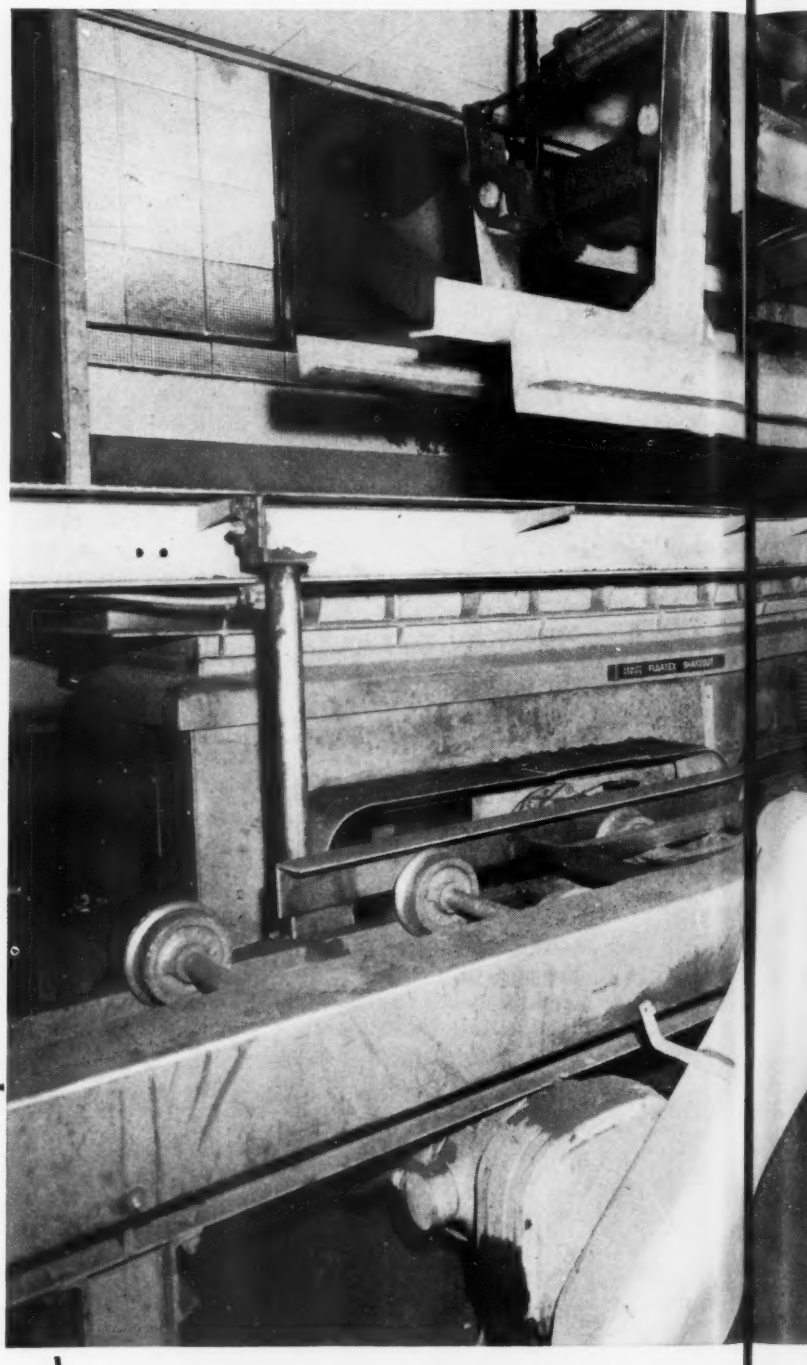

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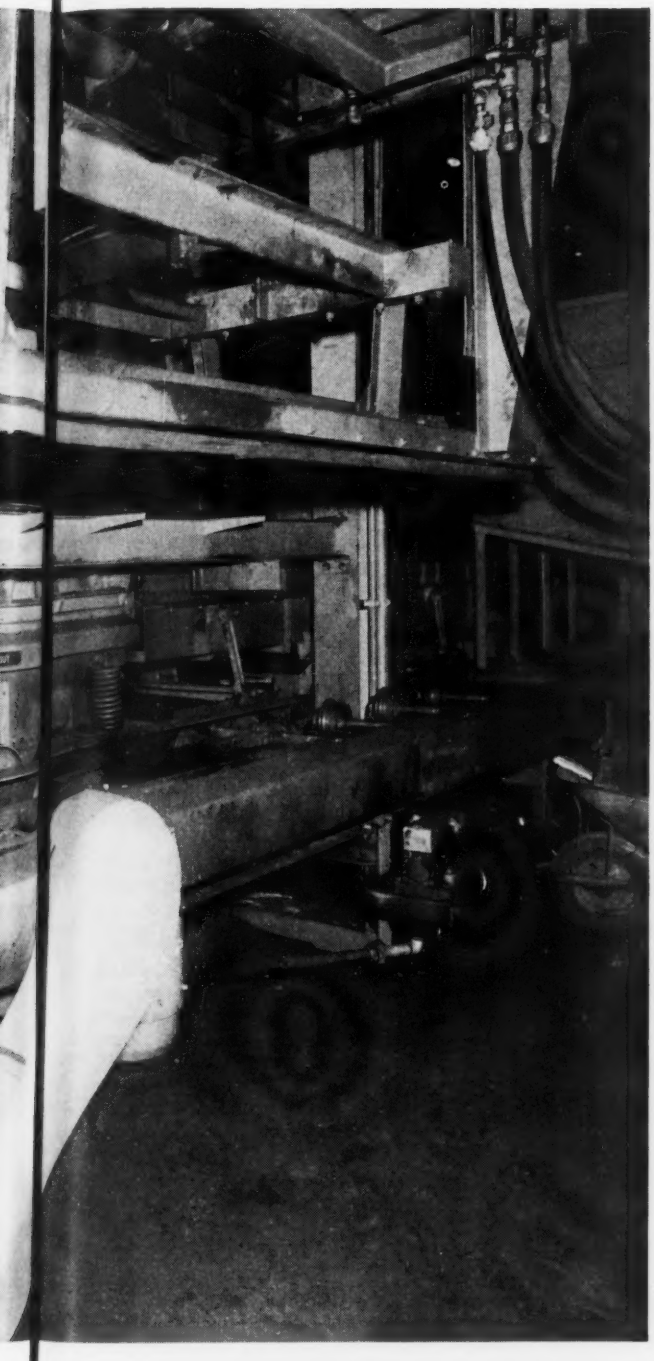

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age are that the ingot remains too long in the mold and that molds are too hot when the ingot is poured. There is reason to believe also that the lower the silicon-to-manganese ratio of the gray iron mold material, the greater the service life. For example, a mold with a 6.25 ratio showed a service life of 133 ingots, while one with a 2.61 ratio gave 171 ingots.

Hot-Blast Cupola Practice, Wilhelm L. Heinrichs, Krupp Foundry, Essen-Bredeney, Germany. After analyzing the cupola melting process and the methods for controlling metallurgical reactions, Mr. Heinrichs described the cupola adopted by the Krupp foundry. It is a neutral, carbon-lined, hot-blast type using a basic slag, lined to 42 in. diam at the melting zone. Top gases are exhausted through a gas take-off belt below the stock-line armor and piped to a recuperator which supplies hot blast at 1100°F. The tuyeres are water cooled. Water consumption is 330 to 400 gpm with approximately 70 gpm of the return water diverted for granulating the slag.

Slag is tapped continuously to insure correct metal/slag and slag/coke reactions. Metal and slag flow continuously from front slagging box in which the slag depth is determined by its level at the dam.

The cupola, now operating only eight hours a day, is expected under 24-hour service to supply the foundry with its total requirements of 5000 to 6000 tons per month.

In 12 months of operation, it has produced economically a number of special grades of iron required to meet the production needs of the foundry.

Development of Hot-Blast Cupola Melting Technique in Europe, Ernst Loebbecke, W. Strikfeldt & Co., Gummersbach, Rhineland, Germany. Hot-blast cupolas first were tried during the war to compensate for the poor quality coke available. In the research conducted by the International Research Group for the Hot-Blast Cupola, it was found soon that slag depth in an acid-lined hot-blast cupola controls the Si content of the molten metal. This requires use of front slagging with continuous removal of slag and iron. Experience also has proved that S content of the molten metal is lower with the smaller coke charges. The proportion of sulphur in the slag to sulphur in the metal increases with increasing metal temperature and decreasing FeO content of the slag.

Physical characteristics of the cupola to produce these results include: Blast temperatures should be comparatively high, above 750°F; freely movable wind belts; new tuyeres; a cooling system for the melting zone. Water is introduced into the cooling tubes under pressure and removed as saturated steam. Utilizing the heat of vaporization, the amount of make-up water to the system is reduced to 0.1 to 0.2 that of normal water cooling designs and the heat lost in the cupola through cooling can be reapplied economically in the form of steam.

The paper concludes with a discussion of operating a hot-blast cupola without a lining through centering the melting zone by increasing the velocity of the blast through the tuyeres. With this type of cupola it is possible to switch the type of slag through additions to the cupola rather than by reaction with the lining.

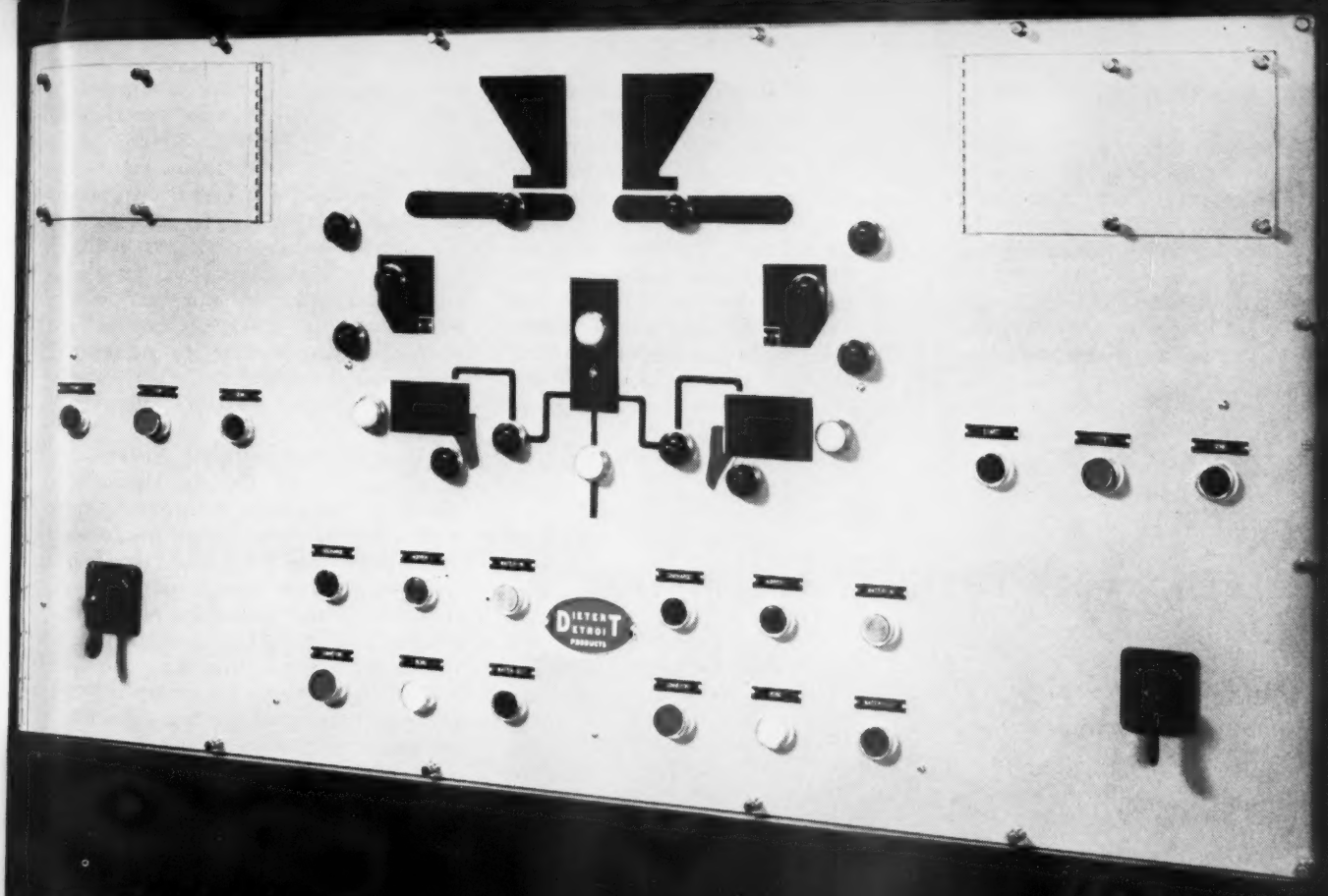
Discussion—Those at the meeting were almost unanimous in the belief that gas or oil external heating of the blast would be more economical in this country than the construction and maintenance of a recuperator which the author described in the paper. Mr. Loebbecke stated it is not important how the blast is heated, but rather that it be introduced into the cupola at a high and constant temperature.

Influence of Temperature on Mechanical Strength of Coke—John Varga Jr. and H. W. Lownie Jr., Battelle Memorial Institute, Columbus, O. Presented by Mr. Varga. Results of new research show that mechanical tests conducted at room temperature cannot be used to predict the extent to which coke will break up mechanically at the service temperatures encountered in cupolas. The rate at which coke breaks up and the total amount of breakage which occurs are different at room temperatures than at the higher temperatures met when the coke is used in the cupola.

The research developed a method for testing the mechanical strength of coke at temperatures likely to be encountered in service, but no attempt was made to correlate results of the tests with performance of the coke in a cupola. The method of testing described is adaptable to a wide variety of materials. Anthracite, char and special types of coked products have been tested to yield information that has been useful and often surprising.

Evaluation of Coke Quality by a Compressive Test — D. E. Krause, technical director, and E. A. Lange, research engineer, Gray Iron Research Institute Inc., Columbus, O. Presented by Mr. Lange. Suitable evaluation of quality of foundry coke as a means of predicting its behavior in the cupola has been of interest to foundrymen for many years. Foundry coke has a number of measurable properties, many of which are related to its behavior in the cupola. Many properties are interrelated so that a relation of a coke property, not considered directly applicable to the performance in the cupola, may sometimes be found. These relations sometimes are fairly good although a change in coking practice may appreciably alter the relation of such

Incoming foundrymen at the exhibit hall pause to examine castings which won the national prizes in the annual apprentice molding competition



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a coke property to cupola performance.

In the last 15 years the institute has tested 86 lots of foundry coke from 18 producers for compressive strength, ignition temperature, volatile matter content and ash content. Results are reported.

Although the compressive strength test for evaluating foundry coke has some shortcomings, it should be considered a useful test. Since the amount of coke actually tested is relatively small compared with a shatter test, the sample must be representative. Although some sort of strength test has thus far proved to be the most useful of the many coke tests devised, the quality of foundry coke should not be judged solely by its strength. A combination of some type of ignition, reactivity or combustibility test with a strength test will probably be required to define the quality of foundry coke completely. The problem of proper sampling of a shipment of coke is a large one and an easy solution does not appear probable.

Discussion—A quick practical test for predetermining coke compressibility in the cupola was described by Charles F. Walton, director of research, Gray Iron Founders' Society, Cleveland. A cast iron plate to which a steel rod is affixed, is lowered to the coke bed just before the cupola is charged. A pipe is slipped over the rod and held in a fixed position. After the cupola is charged it is possible to measure the distance which the plate—and coke bed—have settled from the weight of the charge.

Use of Pig Iron in Iron Foundries—H. W. Lownie Jr., Battelle Memorial Institute, Columbus, O. Particular attention was directed to specifications, prices, secondary elements and "heredity." This was a comprehensive presentation embracing historical information on pig iron manufacture, trade terminology, uses and metallurgical properties. Its contents will prove to be a reliable reference work for pig iron producers and users.

Heredity of pig iron—the tendency for the microstructure and properties of some pig irons to be repeated in iron castings, even though the composition and cooling rate of the castings are quite different from those of the pig iron—was discussed at considerable length. It has yet to be explained, but the answer may come if given sufficient study.

Sub-Surface Blowholes in Gray Irons and Their Association with Manganese Sulphide Segregation — W. G. Tonks, British Cast Iron Research Association, Birmingham, England. Presented by G. A. Timmons, Climax Molybdenum Co., Detroit. Small blowholes usually are spherical, with smooth but generally dull surfaces. They often contain a slaglike material and usually are not fully revealed until the surface metal has been removed. This defect presents two common features: 1. The appearance of a slaglike material in the defective area. 2. A segregation of manganese sulphide within the defective area.

Experimental work showed that for a given manganese and sulphur content, the incidence of subsurface blowholes increases as pouring temperature falls. Low pouring temperatures thus appear to be the primary factor in promoting such defects. At a given pouring temperature, the product of managanese content of the metal times the sulphur content has a critical value which when exceeded promotes the occurrence of subsurface blowholes. Basic practice is important. In blow prevention, for example, keeping ladles clean is more important than coring.

In discussion, it was pointed out

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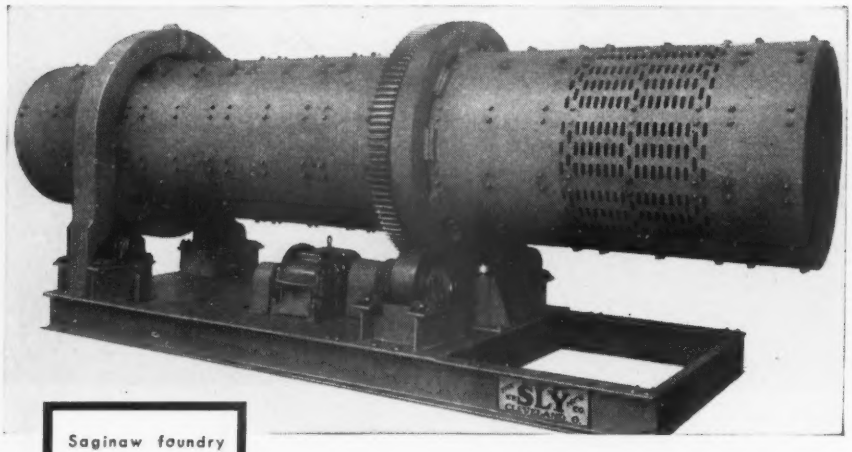

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"Core quality is unquestionably better"

Says Lebanon Steel Foundry

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THIS 75 KW THERMEX* Core-Baking Unit was installed last October in the Lebanon Steel Foundry, Lebanon, Pa. Here's what Philip A. Repino, Plant Engineer, reports on one outstanding advantage proven in the first six months of operation:

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This progressive steel foundry also found that electronic baking gives faster, smoother production—at lower cost! Power costs have been reduced from $4.00 to $1.20 per ton. Breakage has been cut to the bone and spraying eliminated. Storage space and rehandling are substantially less.

Find out—today—how *you* can improve *your* quality, increase production and cut costs with THERMEX Electronic Core-Baking Equipment. Call or write The Girdler Company, Louisville 1, Kentucky.

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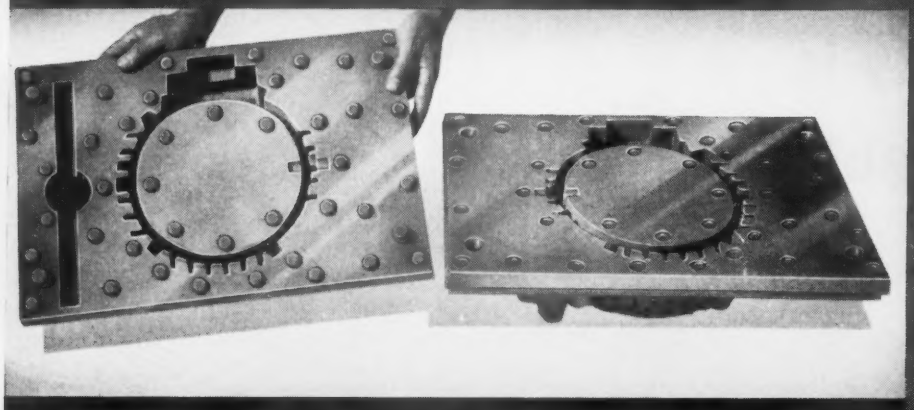

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The production advantages of the shell molding process have made a most important impact upon both the large and the small foundry. Its future is assured. New automatic machines and resin binders to keep pace with their speed are well past the laboratory stage.

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This economical resin produces high-speed curing rates with the minimum of resin content. Savings are achieved in time, sand, work space, handling and metal. Castings are more accurate and smoother—require considerably less finishing.

In addition to Shell Molding Resin 9616, Catalin produces a wide range of core binding liquid resins and powders for the production of ferrous and non-ferrous metal castings.

Catalin representatives, familiar with the requirements of the foundry industry, are available for consultation. Samples on request! Write . . .

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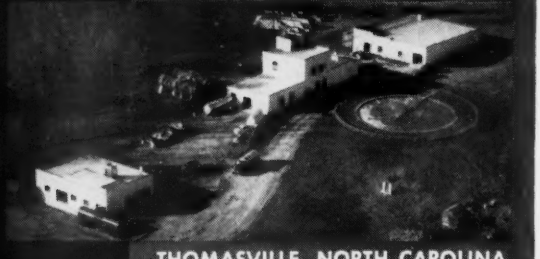

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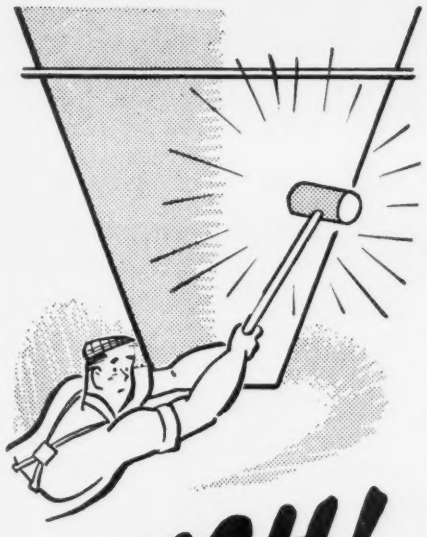

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that manganese sulphide segregation is not the whole story. Mold venting, for example, is closely associated with the blowhole problem, too. Charles Walton, Gray Iron Founders' Society, Cleveland, stated that formation of a bubble cannot occur chemically. Instead, a solid particle—slag—is used as the nucleus.

Heat Treatment of Gray Cast Iron—A. H. Rauch and J. B. Peck, Deere & Co., Moline, Ill., (presented by Mr. Peck, discussion handled by Mr. Rauch). Physical properties of four sets of quenched and tempered bars, each poured from the same ladle, were investigated for transverse bending, impact resistance, ultimate tensile strength and modulus of elasticity. Results show that gray iron will respond uniformly and satisfactorily to heat treatment within the limits of a suitable range of section size commensurate with its hardenability.

Chromium, nickel and copper used singly do not affect hardenability appreciably. Molybdenum by itself raises hardenability only moderately, but when used in combination with nickel is very effective. The Rockwell C hardness test does not indicate the actual hardness of the metal matrix in either the quenched or tempered condition. The as-quenched matrix responds to tempering in the same manner as a 0.50 to 0.60 per cent carbon, 2 per cent silicon steel. Gray iron has lower strength and impact resistance in the as-quenched condition than in the as-cast.

Tempering properly can restore impact resistance, deflection and transverse bending strength to as-cast values. Tensile strength can be raised to from 38 to 72 per cent above as-cast values by tempering at 600 to 800°F. The secant modulus of elasticity is decreased slightly by heat treatment.

It was brought out in discussion

"Now I know what a jolt-squeezer is!"

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ON LARGE THIN-WALL GREY IRON CASTINGS

you can't risk scrap losses from slag. Regardless of the casting size, scrap losses cost you $$$. That's why it pays to be particular about ladle linings. You are in no position to gamble, so use a performance-proved refractory.

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Linings cannot erode away or slag off, because slag and metal will not stick to *IRONTON* RAVENITE. Give your men Ironton's black plastic refractory, RAVENITE, and get their reports on its good service. Order *IRONTON* RAVENITE in cartons, drums or bags to suit your preference. Do it today and forget your ladle worries.

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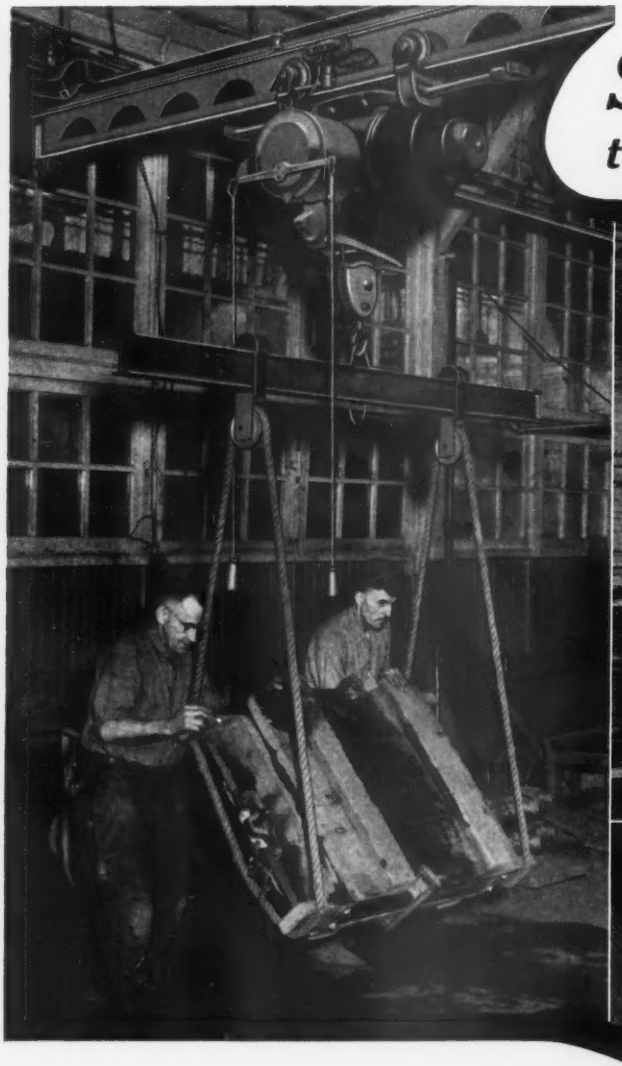
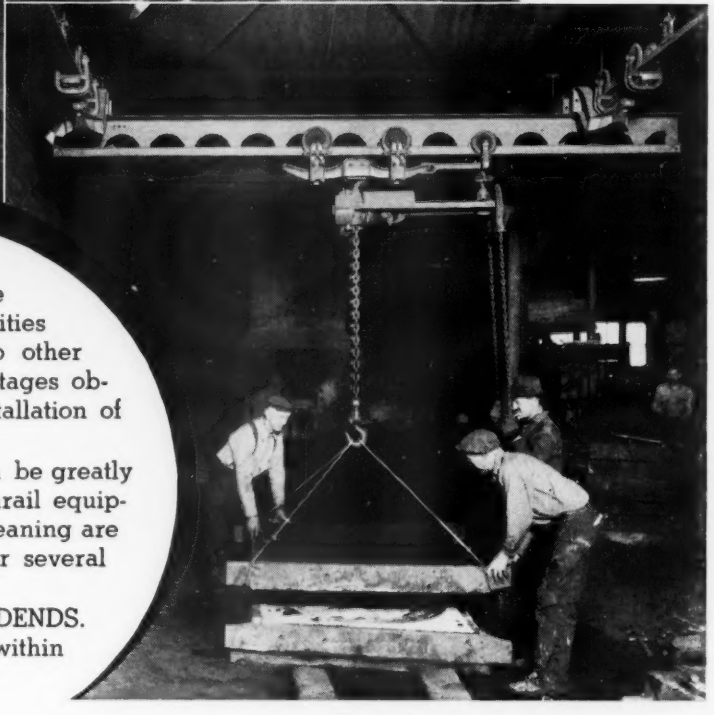
the efficient Cleveland Tramrail Way





Wherever materials of any kind in a foundry are lifted, moved or handled, there usually are possibilities for effecting important economies. Probably in no other way can so much be saved and as many advantages obtained for such a small investment as through installation of proper materials handling equipment.

Mold-making is one of the many jobs that can be greatly eased and speeded with overhead Cleveland Tramrail equipment. Pouring, sand-handling, cupola-charging, cleaning are others. Often the same equipment can be used for several different purposes.

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Pyro Lance models are available for a wide variety of metals and foundry operations. Write today for Bulletin 1724-D and see how you can have low-cost quality control in your foundry. Illinois Testing Laboratories, Inc., Room 511, 420 North LaSalle St., Chicago 10, Illinois.

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that quench cracking seldom occurs, although it is possible. Heat-treated castings can be substituted for chilled gray iron or permanent mold castings. H. W. Lownie Jr., Battelle Memorial Institute, Columbus, O., asked about the variations in impressions made with the Rockwell C method. They cover a range of about 10 per cent of true value, Mr. Rauch said.

Causes and Effects of the Grain Size in Lamellar Gray Irons (Official French exchange paper from Association Technique de Fonderie, Paris, France) — Michel Ferry and Jean-Claude Margerie, Centre Technique des Industries de la Fonderie, Paris. Presented by J. S. Vanick, International Nickel Co., New York. Mr. Vanick, who also translated the paper for presentation, introduced it as a highly theoretical discussion which calls for more work. Purpose of the paper is to correlate grain size variations in pearlitic gray iron.

Cell boundaries are likely to be developed because they carry impurities such as phosphorus. Grains can be counted to relate structure to shear strength. A mathematical formula for grain size can be developed from temperature differential, the surface-volume ratio and a specific heat constant.

Cooling rates and cellular structure progress thusly: Large cells, thick flakes; fine cells, medium flakes; very fine cells, medium rosettes. Normal cells show carbide shells, small cells are carbide surrounded and final stage is white iron.

The cell-size principle works better with high-carbon irons. The number of cells decreases as pouring temperature drops. High temperature gives higher strength in low-strength irons with no change in hardness.

Editor's Note: Reports on other technical sessions of the AFS Congress will be presented in the July issue.

"Jones is bucking for a raise again!"

Not a speck of slag or metal sticks to linings of IRONTON BERLITE

FILLED 974 TIMES, a 1200-pound ladle handled 670 tons of metal before the lining of *IRONTON* BERLITE was replaced. The iron was poured at 2850° F. in a foundry making automotive housings.

Clean Ladles are a profit factor . . . protecting quality of castings, reducing scrap, saving labor. It pays to use *IRONTON* BERLITE in hand, bull and mixing ladles . . . because BERLITE does not shrink or expand, resists slag and metal erosion, has a higher P.C.E. than any fire clay material. Ask an Ironton "MAN WHO KNOWS" how you can put BERLITE to work throughout your foundry.

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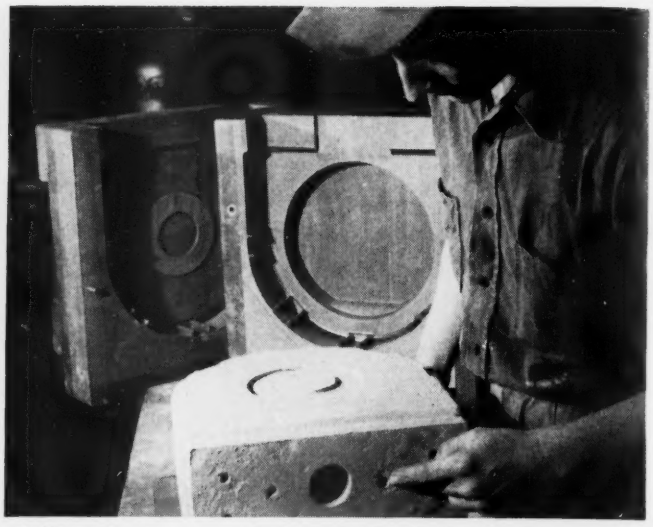
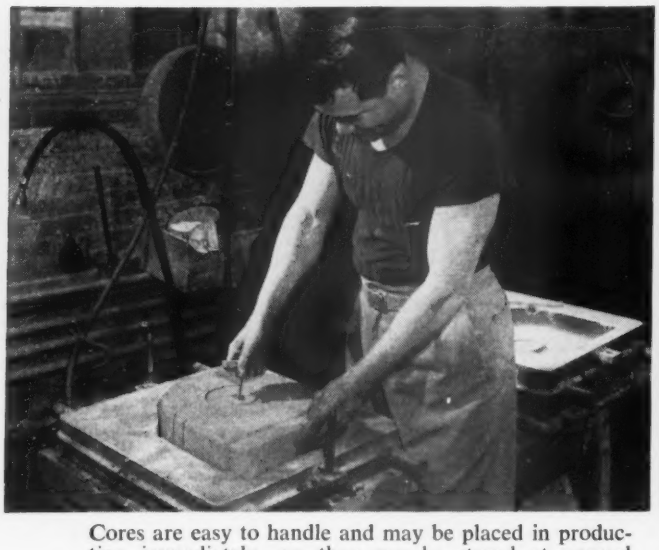
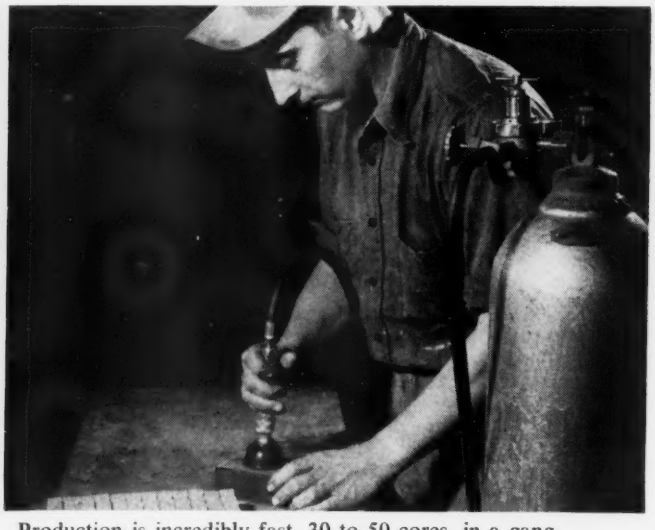
This process eliminates the use and cost of heavy equipment, and can be located anywhere in a foundry. It is ideal for shooting machines, shell molding and hand ramming.



Solid castings are assured. Cores harden in the core box and are not subject to deformation by handling and transporting. Extremely small tolerances can be maintained.



Cores are easy to handle and may be placed in production immediately, or, they can be stored at normal temperatures. Obnoxious fumes are eliminated. Sand recovery is excellent.



Production is incredibly fast. 30 to 50 cores, in a gang, can be hardened in seconds. Shell molding—usually complicated—is simple and inexpensive. Rejects caused by hot tear are reduced to a fraction.

Carbon Dioxide process hardens molds and cores in 5-to-15 seconds—eliminates ovens!

The carbon dioxide injection process is the first and only method of "baking" molds and cores without heat. Pureco CO_2 used in conjunction with specially prepared water glass binders can reward foundrymen with phenomenal savings in time, space, and capital investments while providing unprecedented flexibility. See your Pureco man for full information.

- **Eliminates baking ovens . . . saves time**
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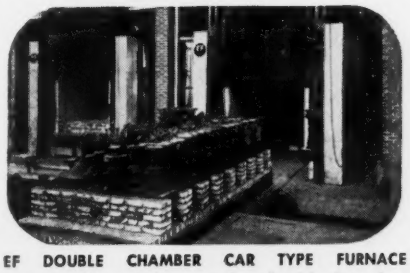
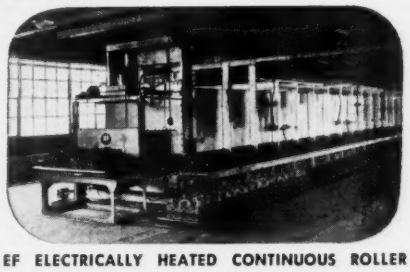
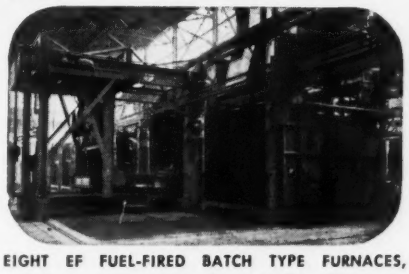


EF DOUBLE CHAMBER CAR TYPE FURNACE for annealing castings, equipped with three furnace cars and one transfer car incorporating car puller. Built by The Electric Furnace Co., Salem, Ohio.



EF ELECTRICALLY HEATED CONTINUOUS ROLLER HEARTH FURNACE for the scale-free annealing of various iron alloy castings in special atmosphere. Built by The Electric Furnace Co., Salem, Ohio.



EIGHT EF FUEL-FIRED BATCH TYPE FURNACES, showing gantry crane that handles the large, heavy castings into and out of the furnace and quenching equipment. Built by The Electric Furnace Co., Salem, Ohio.

Foundry Bulletin No. 461

shows typical installations of EF Gas-fired, Oil-fired and Electric Furnaces

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Texas Foundry Marks 80 Years As Producer of Gray Iron

Founded in 1876 as the Marshall Mfg. Co., the Marshall Car Wheel & Foundry Co., Marshall, Tex., is celebrating its 80th anniversary this year. Always a gray iron foundry, the company originally produced jobbing castings mainly for railroads and sawmills, but now makes gray iron castings for many uses. In the last ten years, the firm has spent more than $250,000 for expansion and modernization of its plant.

In 1936, soil pipe and soil fittings were added to the organization's line, and those items now are among its most important products. Their production is being increased 35 per cent this year. In 1940, a line of castings for counterweights and beam weights for the oil field industry also was added. The company employs about 240 workers.

Observes 35th Anniversary

Wolff & Dungey Inc., Syracuse, N. Y., is observing its 35th anniversary this year. The company was founded in 1921 as a jobbing pattern shop by Robert Wolff, president, and Thomas Dungey, vice president, both of whom are patternmakers.

After a number of expansions and changes in location, the company branched out into production of aluminum sand castings, and today that operation is the larger of the two.

Book Review

Handbook of Fastening and Joining of Metal Parts, by Vallory H. Laughner and Augustus D. Hargan, cloth, 9 x 11 in., 622 pages, published by McGraw-Hill Book Co., New York 36. Price $15.

Contents of this volume comprise an extensive compilation of data on standards, performance and methods to aid in the selection of the most suitable methods for assembling metal parts and products. Planned to help both designers and production men, it discusses such factors as the joining of dissimilar metals, types of resins and adhesives that can be used to fasten metal to either metal or other materials and the advantages and disadvantages of different types of joints.

Screw thread and nuts, collars, couplings, keys, brazing, soldering and types of welding are covered in detail. A 200-page section, prepared in picture and caption fashion, is devoted to techniques for solving a number of special problems in fastening and jointing. The book contains 262 illustrations.

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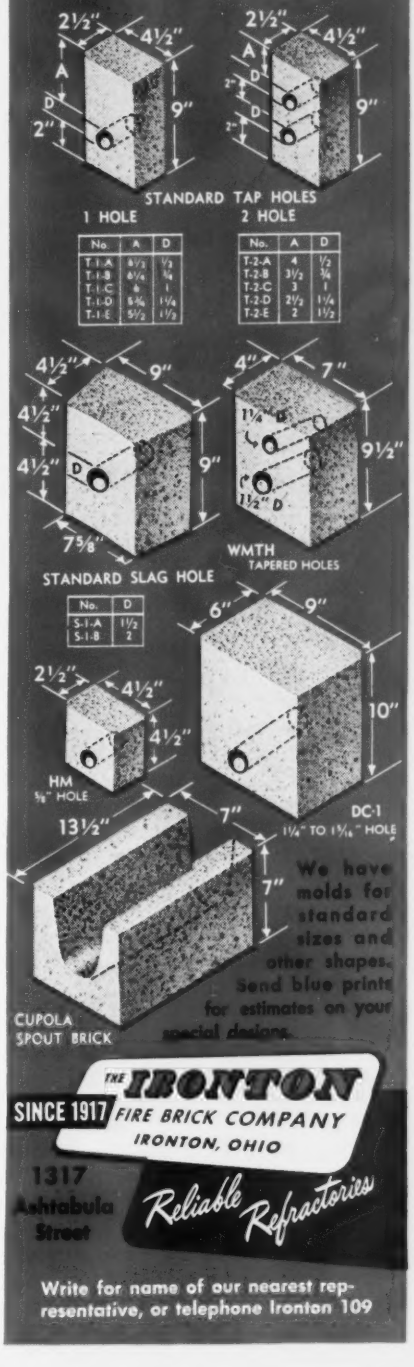

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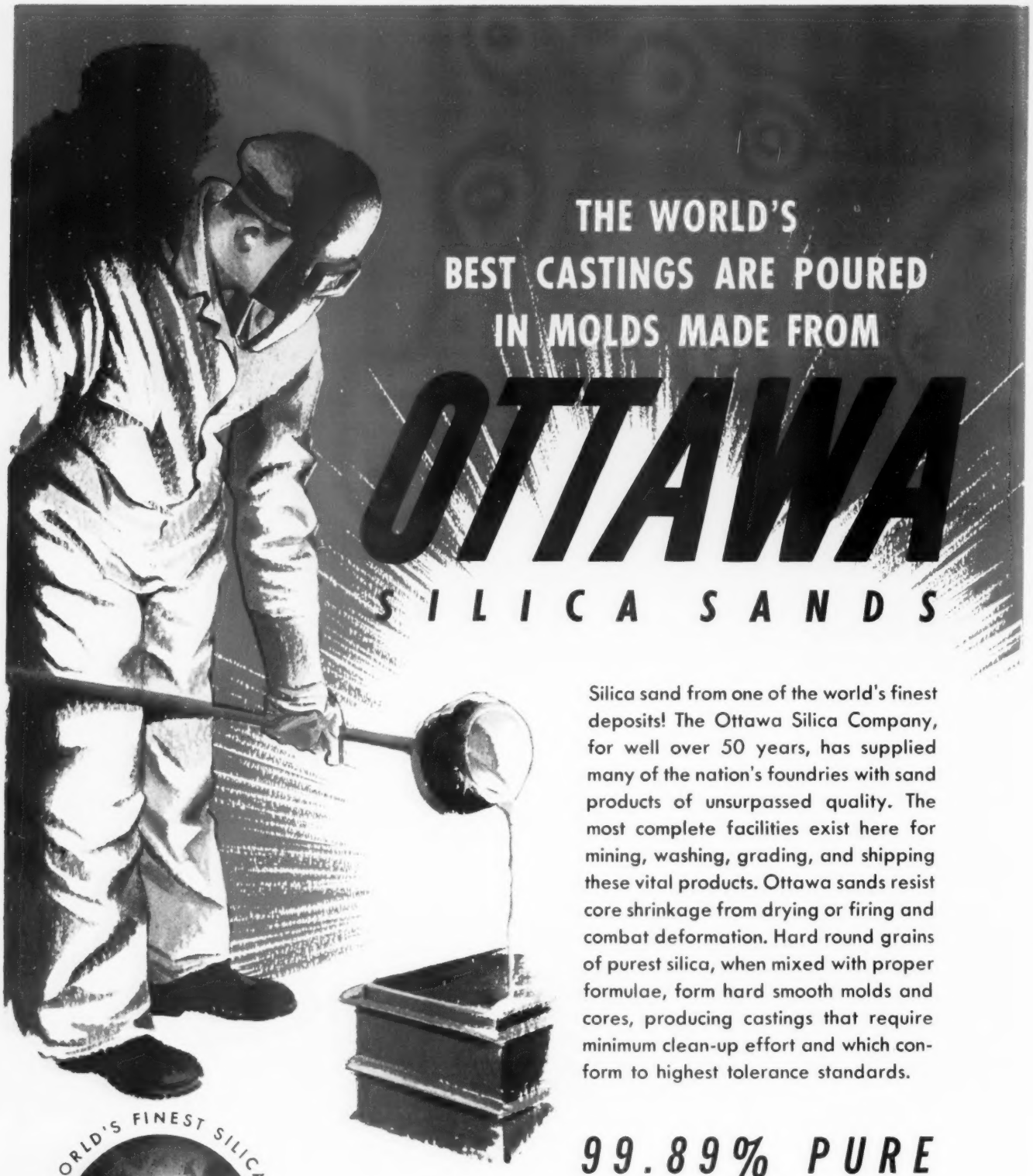

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Serviced by two main trunk railway systems, Ottawa offers fast delivery to all corners of the nation.

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Laboratory tests prove Ottawa Silica 99.89% pure.

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Foundry Developments

By EDWIN BREMER
Metallurgical Editor

DEVELOPMENT of a ceramic frit-silicone resin type paint, said to be capable of withstanding temperatures up to 1400°F without significant deterioration or loss of protective properties is described in a research report of the Army Corps of Engineers available from the Office of Technical Services, U.S. Department of Commerce, Washington 25. Paint consists of a blend of ceramic frits, pigments and refractories at a pigment volume concentration of 35 to 40 per cent with a frit to pigment and refractory ratio of 3 to 1. Report containing 153 pages is designated PB 11957—"Development of Heat-Resistant Paints" by M. Kornbluth, and the price is $4.

Locates Cracks

FOUNDRY engaged in production of automotive gray iron castings is employing a small portable Magnaflux, yoke-type unit for determining presence of cracks. It is used as a quick test for both control of cause of cracking and for 100 per cent inspection in critical areas in some castings where sharp change in section may lead to cracking.

Forward Look

WITH all the activity directed toward development of atomic furnaces the suggestion of one producer that pig iron may be manufactured by use of atomic energy in ten years from now is within the realm of possibility.

Studies Transformations

HIGH-temperature x-ray diffraction techniques were used at Naval Research Laboratory to study and compare isothermal and continuous-cooling bainite transformation in four alloy steels. With short austenitizing time the transformation to bainite was more rapid with decreasing austenitizing temperatures for steel without boron, but a possible reverse effect was observed in a boron-containing steel. For predicting continuous-cooling transformation from isothermal diagrams, a rapid graphical solution of the Scheil approximation is described in which the isothermal diagram is used as one scale of a slide rule. Report is entitled "X-ray Diffraction Studies of the Bainite Transformation in Four Alloy Steels" by Birks and Seal, and designated PB 111771. It may be obtained from Office of Technical Services, Washington 25, for 50 cents.

Permanent Mold

RECENT British patent No. 733,-681 applies to a permanent mold process using an aluminum alloy mold. Mold material contains 1 per cent Cu, 1.15 per cent Mg, 11.7 per cent Si, 1 per cent Ni, remainder Al, and is anodized on the cavity and outside surfaces. Additionally, the inside surface may be refractory coated. In producing aluminum castings, the relation of headers or risers to casting volume is in the ratio 1:1 to 10:1. In the case of ferrous castings the ratios range from 0.33:1 to 5:1. Other means of varying the solidification rate also are described.

Solves Problem

SOLUTION of some of the problems in producing low-carbon steel castings by the shell molding process is indicated in a paper by Navarro and Taylor presented at the recent annual convention of the American Foundrymen's Society. Casting surface improvements were obtained by addition of certain grades of MnO_2 or combinations of MnO_2 plus PbO_2 to the sand-resin mix. Additions of sodium, magnesium and calcium carbonates also improved surface finish markedly. For plate-type sections over ½-in. thick, zircon sand or forsterite should be used. Good surfaces were obtained with silica sand bonded with sodium silicate and blown onto a heated pattern.

Low in Nickel

NEW aluminum casting alloy for automotive pistons and similar applications has been developed by Aluminum Co. of America. Designated as F132 the alloy has a lower nickel content than the older D132 alloy. It contains a maximum of 0.5 per cent Ni and permits a maximum Zn content of 1.0 per cent. Mechanical property test data are said to indicate that room-temperature and elevated-temperature properties of the F132 alloy are the same as for D132.

Traps the Dross

INVESTIGATION of vertical gating systems by Grube and Kura (AFS *Transactions*, 1955) developed an interesting point with reference to entrance of metal into the bottom of the casting. That is, extension of the cross runner at least 5 in. beyond the point of entry into the casting cavity functions as an effective dross trap. A shorter extension appears to permit the dross to back up into the casting cavity.

High Sulphur

LATEST addition to the several types of ferrous alloys is termed "malleable base spheroidal iron." It was developed by Albion Malleable Iron Co., Albion, Mich. According to a paper by Rote, Chojnowski and Bryce presented at the recent AFS annual convention, the material is produced from conventional duplexed metal used in manufacture of pearlitic and ferritic malleable by addition of sulphur to obtain around 0.40 per cent in the final metal, and a solid-state graphitizing agent. Product seems somewhat akin to a German material mentioned in this column in March.

New Process

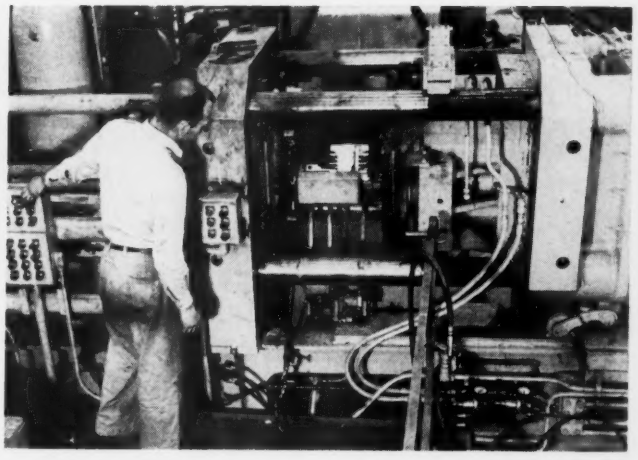
FIRST heat of titanium metal sponge at the new Ashtabula, O., plant of Electro Metallurgical Co., a division of Union Carbide & Carbon Corp., was completed on Apr. 26. In the process, sodium is used to reduce titanium tetrachloride which is said to result in metal of high quality. Plant has a capacity of 7500 tons yearly, and is expected to reach that by the fourth quarter of 1956. The titanium sponge produced will be remelted into ingots by producers of titanium mill products and shapes.

Melts Stainless

PROCESS of melting stainless steel in a reverberatory furnace is described in U.S. Patent No. 2,734,818. Furnace is basic lined, and high chromium and nickel containing scrap is melted in the throat of the furnace in combination with ferrosilicon, calcium carbide, fluorspar and sodium carbonate. Furnace temperature is maintained at 3000° F.

News Views

SAFETY AWARD: For the third year, Zenith Foundry Co., West Allis, Wis., has won an award from its compensation insurance carrier for having completed a year's continuous operation with a perfect safety record. T. H. Tanner, vice president and secretary, left, accepts plaque from Myron Kojeca, Employers Mutuals of Wausau, Wis. Watching are P. B. Iattoni, foundry superintendent, and Mrs. Agnes Nance, company nurse



MOTOR PLANT: General Electric Co. has built a modern $7 million medium motor plant at Schenectady, N. Y., that is believed to be the world's most modern factory for the manufacture of induction motors. Plant makes possible a three 8-hr shift production cycle on 7½ to 30-hp motors. Former schedule took two weeks. The only casting done in the plant is diecasting, at right, where a rotor core is seen following the injection cycle. Internal fins are cast in one piece

FEF STUDENTS: At a recent meeting of its FEF Industry Advisory Committee, Pennsylvania State University students were entertained at a dinner as scholarship certificates were awarded some of them. In front row left to right, are H. P. Good, manager, Textile Machine Works, committee chairman; B. W. Niebel, acting head of Industrial Engineering Dept., and W. P. Winter, the foundry instructor, both of Penn State. Back row, left to right, are Gene Shue, Thomas Yingling, Henry Keltz, Lewis Geiger, David Anderson and Durwood Rorie, FEF foundry option scholarship students. Harry Albert, Sheldon Brown, Carl Riss, Thomas Santarelli and Frank Todd, other students in the FEF program, were unable to be present when the picture was taken

EXPANSION: Plans to expand its Meehanite foundry facilities have been announced by De Laval Steam Turbine Co., Trenton, N. J. A 6000-sq-ft building addition and modernization of sand conveying, casting cleaning and radiographic inspection facilities are included in the plans. Shown examining a scale model of the expanded and modernized foundry are Charles A. Jurgensen, vice president of manufacturing, John A. Anspach, foundry manager and James P. Stewart, president

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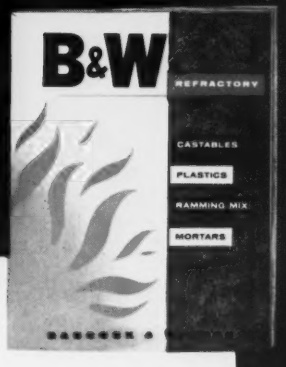

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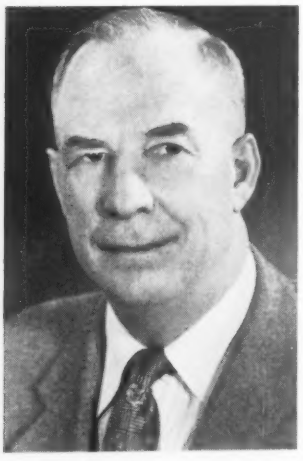
Obituary

MARTIN J. LEFLER, 59, who was plant manager, Oliver Corp., Chicago, died Apr. 6. He was graduated from Michigan State College, and early connections included Deere & Co., Moline, Ill., Union Malleable Iron Co., East Moline, Ill., and J. I. Case Co., Racine, Wis. In 1931 he became general foundry superintendent, Oliver Farm Equipment Co., South Bend, forerunner of Oliver Corp., and in 1937 was made superintendent,



MARTIN J. LEFLER

Western Foundry Co., Chicago. From 1943 to 1947 he was associated with Strom Brass Foundry, Elkhart, Ind. He joined the Oliver Corp. in 1947. Mr. Lefler was the first chairman of the Michiana Chapter of the AFS and was elected a national director for a three-year term in 1953.

John F. Weaver, who was in charge of melting at the Trafford, Pa., foundry, Westinghouse Electric Corp., Pittsburgh, until his retirement three years ago, died Apr. 20. Mr. Weaver started his foundry career with U. S. Radiator Corp., at Newton, Pa. He was foundry superintendent, Columbia Radiator Co., Columbia, Pa., for 12 years.

Herbert B. Sabin, 91, president, Steelblast Abrasives Co., Cleveland, died there May 2. Mr. Sabin was one of the founders of the company in 1929. In 1905 he organized Sabin Machine Co., Cleveland, and was president of both companies at the time of his death.

James P. Lawrence, 66, chairman of the board of directors, American Monorail Co., Cleveland, died Apr. 22. Following graduation from Pennsylvania State University he was associated with E. I. du Pont de Nemours & Co., Wilmington, Del. In 1926 Mr. Lawrence was one of the founders of American Monorail Co., and served as its vice president and president, becoming board chairman in 1952.

Stafford Chappell Sr., former foundry superintendent, Electric Boat Division, General Dynamics Corp., Groton, Conn., died Apr. 15 at his home in New London, Conn. Mr. Chappell was a charter member and a past president of the Connecticut Nonferrous Foundrymen's Association.

Peter Gordon, sales and service representative, J. R. Short Canadian Mills Ltd., Leaside, Ont., died Apr. 13 in Toronto. Mr. Gordon was awarded the Order of the British Empire for his services as foundry consultant for the Canadian Wartime Shipbuilding Department.

James S. Reynolds, 83, former vice president, Richmond Foundry & Mfg. Co., Richmond, Va., died Mar. 28. Mr. Reynolds was secretary and treasurer of the company prior to becoming vice president. He retired from active duty in 1932.

Whitfield J. Bell, formerly representative in Maryland and Delaware for Norton Co., Worcester, Mass., died Apr. 2. Mr. Bell retired in 1953, after 38 years with the firm.

Frederick H. Bassett, 55, a district sales manager for American Steel Foundries, died Apr. 29 in Denver where he had been located the last nine years.

Arnold J. Weller, 63, plant foreman, Central Foundry Co., Holt, Ala., died Apr. 11. He had been with the company for 31 years.

Allegheny Ludlum Releases Casting and Forging Film

A new full-color and sound movie on its casting and forging plant at Ferndale, Mich., has been released for showing by Allegheny Ludlum Steel Corp., Pittsburgh. The 16-mm film runs for 16 minutes and contains technical information in addition to descriptions of the facilities and operations of the Ferndale plant. It is entitled "The Shape of Things."

Copies are available for showing to organized groups on request to Allegheny's advertising department, 2020 Oliver Bldg., Pittsburgh 22.

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Banquet scene at the seventh annual market development conference of the Malleable Founders' Society, at the Edgewater Beach Hotel, Chicago

MALLEABLE FOUNDERS

Look at Future Markets

By JACK C. MISKE
Associate Editor

TWO aspects of the malleable foundry industry's drive to enlarge its markets featured proceedings at the seventh Market Development Conference of the Malleable Founders' Society, held Apr. 12-13 at the Edgewater Beach Hotel, Chicago.

On Apr. 12, the meeting was devoted to "Your Society's Program for Expanding Our Market." On the second day, the topic before the nearly 100 malleable sales executives and salesmen present was "The Outside Viewpoint." James W. Hallock, sales manager, Albion Malleable Iron Co., Albion, Mich., and chairman of the society's market development conference, was chairman.

Mr. Hallock opened the conference and introduced Leon J. Wise, vice president, Chicago Malleable Castings Co., Chicago, whose remarks sounded the keynote for the meeting. Mr. Wise spoke from notes prepared by Carl L. Liebau, president of MFS and president, Federal Malleable Co., West Allis, Wis., who was unable to be present because of illness.

Market development conferences have become a fixture of the society and fill a valuable need for members, Mr. Wise pointed out. Promotion and development cannot be stressed too much. More needs to be done both individually and collectively in those areas. Individuals attending their first such conference can learn much from the material presented, and the meetings always offer new ideas to those who have attended earlier ones.

The next speaker—Lowell D. Ryan, managing director, MFS—discussed the background of the society's activities in market development. Mr. Ryan described the formation of the group in 1896 and its function and development as a central source through which members can pool information and resources for the good of all. He pointed out that activities which would be too expensive and too great in scope for single firms to undertake can be performed relatively simply and at small cost when the burden is shared. Market development is one of the most important of such activities.

Lloyd E. Young, sales manager, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., chairman of the advertising committee, reported on his committee's activities during the last year. The group was started in 1953 to begin a program of business paper advertising. Last year, four insertions were made in each of five publications. These advertisements were designed to publicize castings of all sizes and to promote use of pearlitic malleable as well as standard malleable.

As chairman of the market development committee, Mr. Hallock delivered the next report. He stated that the group's purpose is to publicize malleable and to expand its market. His committee has written and got into print two articles to promote applications and has a third in preparation. The committee also is engaged in market research and sales forecasting. Goal of this work is to discover whether the industry is moving ahead and, if so, where it's going and where its future markets lie.

A report on the society's revised malleable handbook was presented by Mark M. Miller, assistant to vice president of sales, National Malleable & Steel Castings Co., Cleveland. He substituted for H. E. Steinhoff, vice president, Wagner Iron Co., Decatur, Ill., chairman of the handbook committee.

Mr. Miller explained that the membership of the handbook committee is diversified as to size and interest of the companies represented. The book will have promotional impact and will be ready for distribution about a year from this summer. All illustrations have been modernized to show the industry at its best, and most chapters have been expanded. Some have undergone as many as a dozen or more drafts. Contents will include new data on machining and

a new chapter on pearlitic malleable.

Graphs are to be used extensively, and the chapter on design and pattern equipment will be revised and expanded.

Effective distribution and use of the book are vital to its success, Mr. Miller said. It must be placed in the hands of the proper persons. He suggested that a less expensive form might be distributed to students or that the chapters on the metallurgy of both standard and pearlitic malleable might be excerpted and distributed to them. A need exists, he stated, to show metallurgists and designers that there are varying types of pearlitic microstructure, for example.

In the afternoon, James H. Lansing, technical and research director, MFS, presented a roundup of information on the society's technical activities.

The gating and feeding project is being completed this year. Its purpose is to improve the competitive position of malleable companies by cutting costs of production. Those costs would be cut by increased yields resulting from less metal in gates and feeders.

Needs Basic Properties Data

Stressing that any data on properties help to sell malleable, Mr. Lansing said that a basic properties project will fill a definite need. He particularly recommended work on stress-rupture properties of malleable at elevated temperatures. Such work, some of which has been done, may make malleable more competitive with other metals and other forms of fabrication, Mr. Lansing stated. He mentioned that tests have been conducted which show that both types of malleable possess excellent low-temperature properties. Results of these tests are as yet unpublished.

Regarding the society's 1953 core practices report, Mr. Lansing said that some of the society's members are saving thousands of dollars annually through use of the data it contained.

Edward J. Walsh, executive director, Foundry Educational Foundation, Cleveland, discussed the FEF's contribution to the development of new markets for the entire foundry industry. Marketing, he said, is more than selling. It requires a good product which is steadily improved and taken to potential buyers. New buyers must be sought constantly, and research must stand behind the program. Predictions for castings sales in our growing economy are good, but the picture is not fixed. It can alter either up or down. The industry's challenge is to develop new and better methods of marketing. Selling practices must be adjusted logically to changes in markets.

The FEF is reaching into the greatest single source of buying influence —engineers—in this instance, the engineers of the future, from whom much of industry's operating and management personnel will come. In addition to attracting engineers to the foundry field, the foundation is working to familiarize future engineers in any field with the nature and applications of castings as engineering materials. About 6000 students take foundry courses at FEF schools each year. A few hundred come into the industry, and the others go into buying industries with a knowledge of castings.

To close the first day's program, Lowell D. Ryan reported on the results of a market survey for malleable castings conducted in Rockford, Ill., among 43 firms which use castings of various types. Of these, 27 apparently were potential users of malleable.

It was discovered that the general attitude toward castings was good and that almost everyone knew about malleable and looked upon it favor-

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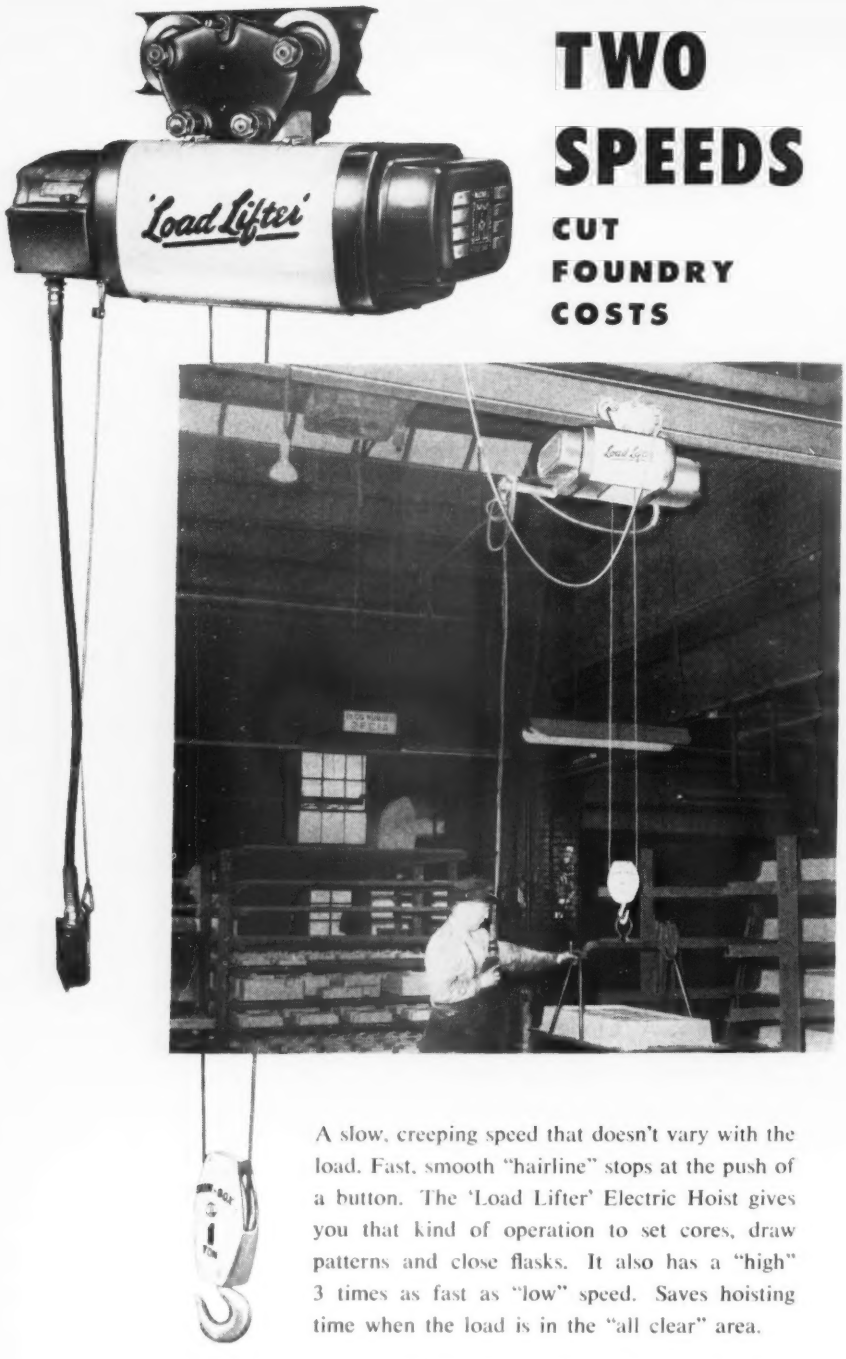

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ably. Pearlitic malleable, as a newer product, was not so well known as standard. Some were having trouble finding sources of malleable. Mr. Ryan suggested that there might be some value in further surveys of this type, in larger areas.

The conference banquet Thursday evening had William Gove, EMC Recording Co., St. Paul, as speaker on the topic, "You Make the Difference," a discussion of what makes an effective salesman. In the course of an extremely entertaining talk, he named these three major points: 1. Be yourself. 2. Be a good listener. 3. Serve your clients. Service often is the only difference between competitors.

First item on the program on Apr. 13 was "The Purchasing Agent's View," presented by Roy Webb, Templeton-Kenly Co., Broadview, Ill. Templeton-Kenly is one of the nation's foremost producers of jacks. The firm uses about 100 tons of malleable castings per month, and Mr. Webb discussed what his company needs and how it gets it.

Keeps Up with New Techniques

It wants a strong, sturdy material which can be poured in either thin or heavy sections. Lightness is desirable because it cuts shipping costs. His company redesigns its products to keep up with improved molding techniques and other forms of technological progress. It uses the best patterns possible, commensurate with cost, based on number and type of castings required.

Mr. Webb advised salesmen to avoid either under or overselling their product. Those who do, he said, usually don't have enough knowledge of what they are selling. He likes to know as much as possible about his firm's suppliers and tries to visit each of them at least once a year. In addition, he expects salesmen to offer service by knowing what's happening to his orders. He stressed that suppliers need good production managers; they are the right hand of salesmen and should be guided by sales managers in their scheduling of orders. Good inspection should be employed to insure that bad castings are not shipped to buyers. When they are, they must be returned, and they only raise everyone's costs.

As part of its policy to co-operate with suppliers, Templeton-Kenly sends blueprints of new parts to foundries for suggestions about how to make it and what to do with the patterns. The company likes to use established sources of supply and does not change sources just to get a lower price.

Elmer E. Braun, production manager, Central Foundry Division, General Motors Corp., Saginaw, Mich., described "The Development of the

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Pearlitic Malleable Crankshaft." This part is cast in shell molds and now is used in all Pontiac cars. Its development began in 1951 and, Mr. Braun said, was a long, hard job. The cast pearlitic malleable unit replaced a steel forging and can be both produced and machined at less cost. In addition, it is said to offer superior characteristics, such as vibration damping qualities, elimination of checkering, good wear resistance, easy balancing and many others. For the complete story of the production of this part, see FOUNDRY, May, 1956, pp. 142-149.

Following Mr. Braun, Thomas Seavey, master mechanic, Pontiac Motor Car Division, GMC, Pontiac, Mich., explained the machining advantages offered by the new cast pearlitic malleable crankshaft. He reported that the part permits faster, easier, cheaper machining. Experience so far has shown that life of some tools has been increased as much as 400 per cent while production has gone up over 25 per cent. In addition, fewer and less expensive tools are required. One of the most notable improvements has been the complete elimination of machining on counterweights, which are cast to tolerance. Scrap is so slight as to be negligible—only a small fraction of 1 per cent.

Members Discuss Conversions

An annual feature of the market development conference is a discussion by members of the audience of conversions they have obtained during the preceding year. The discussion was led by Joe W. Beckham, casting design engineer, Texas Foundries Inc., Lufkin, Tex. Many persons in attendance exhibited and explained parts their companies have converted from weldments, forgings, stampings and other competitive forms of fabrication.

In the afternoon, A. W. Anderson, assistant general supervisor of foundry research, International Harvester Co., Chicago, presented a paper on "Tomorrow's Foundry Products and Processes." The paper had been prepared by Garnet Phillips, of Harvester, who could not be present because of illness. It covered a variety of new foundry developments such as shell molding, shell cores, the CO_2 process, water-cooled cupolas, nodular iron, pearlitic malleable, diaphragm molding, new alloying techniques and others.

Final presentation of the conference was a showing of "Iron Ore in '54," a film prepared by the M. A. Hanna Co., Cleveland, to show the immensity of the job of bringing iron ore out of Labrador for the American steel industry. This ore now is being used in American mills.

Here's a sure way to ease up on heavy lifting. Let the 'Budgit' Aluminum Chain Block "take over" on production and maintenance jobs. This tough, lightweight hoist can lift a 500-lb. load with a hand chain pull of only 25 lbs. Worker energy is conserved — efficiency stays high. Equally important, the 'Budgit' has a fast-acting, automatic brake that helps reduce damage and spoilage when fragile loads are handled. It operates smoothly and easily — provides positive lowering control that makes accurate spotting a cinch.

Whether you require a hand hoist to set cores, to lift ladles or to save time in emergencies, choose the 'Budgit' Aluminum Chain Block. Every part is built for heavy duty. Every capacity — from ¼ to 10 tons — makes work easier and cuts load-handling costs. *Get details from your "Shaw-Box" Distributor or write us for Bulletins 398 and 415.*

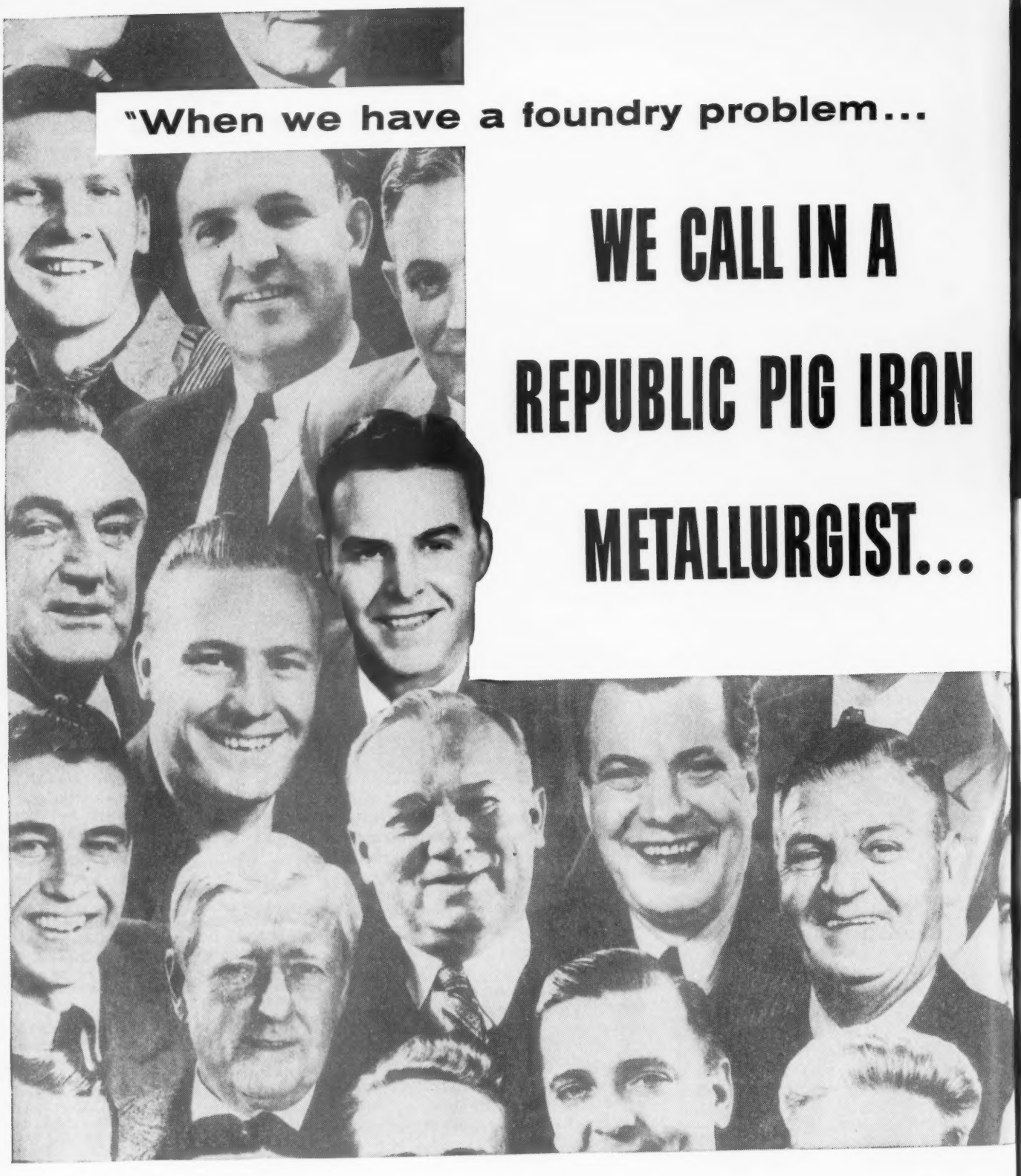
AN I-BEAM TROLLEY adds travelability to any hoist. All types available. Capacities: ¼-ton up. Priced from $18.50. Ask for bulletin.

'Budgit' ® CHAIN BLOCKS

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN
Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Makers of 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments, and Aircraft Products.

"When we have a foundry problem...

WE CALL IN A REPUBLIC PIG IRON METALLURGIST...



REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

he talks a language we can understand"

That statement is typical of the many we receive from foundry owners, superintendents, production men.

Others say, "Another thing we like about Republic, aside from the product, is the Field Engineering Service you give. When we have a foundry problem and put in a call for help, your metallurgical engineers are johnny-on-the-spot. Then it's not long before the problem is licked."

The Republic Pig Iron Metallurgist is a welcome visitor in hundreds of shops. They rely on him for advice on molding practice, pouring problems, improving efficiency. Or for help on reducing costs and increasing output.

He keeps up-to-the-minute on all the latest foundry techniques. He knows all types of pig irons, their characteristics and what they will do or will not do under certain conditions. This thorough knowledge is based upon metallurgical training and years of actual foundry experience.

Next time you have a foundry problem, ask the man who knows his irons – call in a Republic Pig Iron Metallurgist. His service is prompt, confidential and without obligation. Mail the coupon.

STEEL

and Steel Products

THE PROBLEM OF STORING parts, tools, dies, etc., can be resolved with Republic Wedge-Lock Steel Shelving. It is specifically designed for high stacking of enormous weights. Joints actually get tighter and stronger as weight increases. Wedge-Lock Steel Shelving provides maximum loading in minimum floor space. It is completely flexible to meet changing space needs. Assembles quickly and easily.

THE PROBLEM OF SPACE can often be solved with Republic Materials Handling Equipment, like the PB-120T Box and Skid Units shown above. In this application, they freed maximum floor space for production equipment, provided better visible product identification, minimized inventory time, reduced handling costs 25%. Republic specialists will help you design units to meet your specific needs.

THE PROBLEM OF HEAVY-DUTY LIFTING can be simplified with Republic Welded Chain, available in alloy, high carbon or low carbon steel, and wrought iron. *This new catalog* contains complete information and the latest, up-to-date specifications on Welded Chain, Accessories and Assemblies. Order your copy from your Republic Chain Distributor. Ask for Catalog 701. Or mail the coupon.

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☐ Materials Handling Equipment ☐ Steel Shelving

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Around the Country

NEWS REPORTS FROM

Philadelphia . . . Chicago . . . New York . . . Pittsburgh

Chicago—Foundry workers in this area were granted pay raises ranging from 12 to 27 cents an hour over a 12-month period in the new contract agreed upon late in April by the International Molders and Foundry Workers Union of North America (AFL-CIO) and their employers. Some 5000 workers benefit from the increases, which became effective May 1.

The new contract covering 56 foundries in Chicago and 12 in Aurora, Joliet and Batavia, which produce gray iron, brass, bronze and aluminum castings, was ratified by four locals of the union by a 7 to 1 majority. Pattern for the new contract, which runs to May 1, 1959, was arrived at in negotiations which the union conducted jointly with the Chicago Foundrymen's Association, representing 30 foundries, and a group of independent foundries.

The increases range from 7 cents an hour for laborers to 17 cents for journeyman molders and coremakers as of May 1, 1956. Certain inequities in rates established this range. Minimum increases are 5 cents for laborers, 10 cents for semiskilled workers and 15 cents for molders and coremakers. An additional 5 cents an hour for laborers and semiskilled and 10 cents for molders and coremakers will go into effect May 1, 1957. The agreement provides for a reopening of wage discussions May 1, 1958.

With the May 1 increase this year, foundry workers' pay is $1.80 an hour for laborers and $2.40 for molders and coremakers.

Workers also are granted an additional paid holiday, making a total of seven such holidays a year. Employees with 15 years or more of service are granted three-week paid vacations instead of two weeks.

This is the first time a three-year contract has been negotiated, although a two-year agreement was entered into about five years ago. The longer term is hailed as the basis for a stable and harmonious relationship.

"He wasn't kiddin' me any. When he looked at me like I didn't know what I was doin'—I looked right back at him just as if I did."

New York— The edge appears to be a bit off on gray iron foundry business, and there will likely be a further lag before the end of June, with the approach of hot weather and the vacation season. However, demand is still good, with gray iron shops averaging a little less than 80 per cent of normal. Most foundries are working five days a week and some with full operating forces.

Foundries specializing in castings for building work and machinery are doing well. Their backlogs are extended six and seven weeks, which is above the average for the gray iron shops in this area. The relatively small capacity for malleable and steel castings here is being well absorbed.

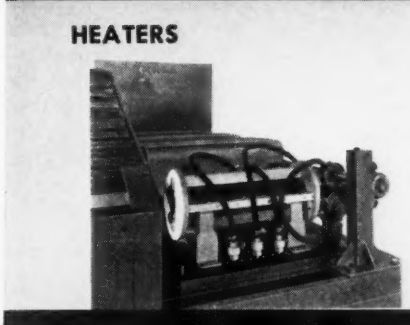
Business with the red metal shops reflects a gain in plumbing and water meter requirements, which, in turn, indicates an improvement in housing starts. However, the captive shops have not been called upon to sublet tonnage, as was the case a year ago. Pump machinery business is good, and there is a steady improvement in marine hardware requirements. Aluminum shops not heavily engaged in aircraft work have to fight for business but are generally successful in maintaining a good rate of operations.

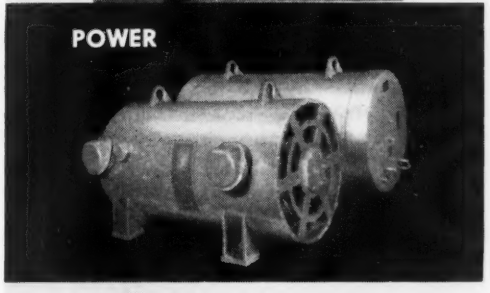
While pig iron prices were advanced $1.50 a ton at the beginning of this quarter, foundrymen look for a further boost early this summer or as soon as steel labor contract negotiations have been settled. Actually, this settlement will probably result in higher prices on some of the ferroalloys, including, possibly, ferromanganese and spiegeleisen.

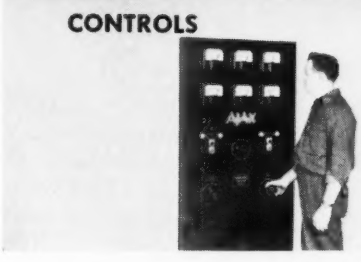
Pittsburgh—Possibilities of a strike or a slowdown in steel production in the third quarter have not dampened bright outlook in this area for sales of equipment to steel mills. Foundrymen say demand for heavy castings remains very strong.

One foundry forced to expand by

AJAX... for complete induction heating-melting systems







Behind every induction furnace there must also be a source of power and a means of controlling that power. While the characteristics of any one of these three elements limits the selection of the other two, there are no hard and fast rules to follow when designing a complete system. Only experienced specialists can effect the perfect match which alone assures you all the advantages induction methods can provide.

You can get some idea of the breadth of choice which exists when planning a system from the general descriptions below. For further details, write Ajax Electrothermic Corporation, Trenton 5, New Jersey.

FURNACE

Tilting Type: Usually chosen for ferrous metals and larger charges of non-ferrous metals. Close coupling between coil and charge makes for high efficiency. Double trunnion keeps spout close to mold.

Lift-Coil Type: For non-ferrous metals in charges to 300 lbs. Inductor coil lowered over charged crucible; raised after charge melts; lowered over second crucible. Highly flexible.

Vacuum and Pressure Type: Wherever exceptionally high purity is required. Custom designed for charges from a few pounds to over 1000 lbs. (steel).

Special Types: AJAX has often drawn on its long experience to design and construct numerous furnaces and crucibles of special sizes and shapes and materials.

HEATERS

General Purpose: Inductors can be designed for any induction heating job. Inexpensive heaters can easily be interchanged for various load sizes and shapes. Special inductors are available to focus heat for forging, brazing, hardening, soldering, etc.

Carbides: These special furnaces for making and hot-working carbides are usually equipped with graphite crucibles or sleeves, able to withstand very high temperatures. Units are available for hot-pressing carbides in vertical or horizontal presses.

POWER

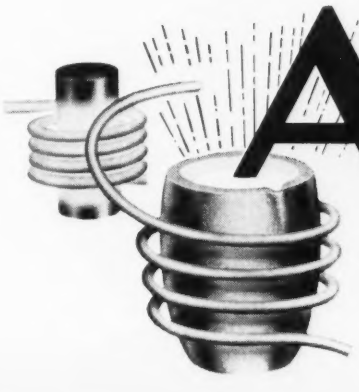
Motor Generators: Used for most large production heating and melting jobs. Available at frequencies from 1 to 10 kc, with output from 30 to 1250 kw and up.

High Frequency Converters: Spark gap converters used in laboratories and for small production jobs. Self-tuning. Frequency range from 12 to 60 kc, at power ratings of 6, 20, and 40 kw.

CONTROLS

All controls for an AJAX installation are grouped in one convenient location. Complete instrumentation permits even a relatively unskilled operator to keep the furnace at top efficiency. The panel shown controls a motor generator set. Converter controls are generally more simple, and are mounted on the converter cabinet.

Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.



AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING

the growing market is Hyde Park Foundry & Machine Co., Hyde Park, Pa., supplier of gray iron castings and steel mill equipment. Says a company representative, "We are extending our foundry 60 ft to enable us to produce more heavy castings, ranging as high as 80,000 lb."

Foundrymen agree that automakers have not slowed their demand, and steel mill expansion should make the third quarter strong for local firms.

Local foundrymen returning from the Atlantic City convention were impressed with the variety of shell molding equipment and other new machinery displayed there. Among equipment makers, most report a heavy amount of interest in new equipment.

Philadelphia— Most foundries continue to operate at a good clip. Pipe shops are fully engaged, and gray iron job producers appear to be averaging 80-85 per cent of normal. Steel and malleable shops are averaging even better than 85 per cent. Operations at the nonferrous shops are spotty, but still generally good.

The prospect for June as a whole, however, is for some tapering off. Some plants may suspend late this month for mass vacations, with the suspension continuing through the July 4 holiday week. From that time on through to Labor Day operations will likely be affected in one degree or another by vacations and hot weather.

This year, with July 4 falling in the middle of the week, there will probably be more suspensions for vacations around that time than is usually the case. This should be reflected, accordingly, in less down-time for vacations at other times during the summer. However, there will still be no little vacationing, especially in the latter part of August.

Job shops have six to eight weeks' work on hand. This is especially true of those engaged in heavy work, although they are experiencing some let-up in auto dies, with probably a further drop to come, as indicated by a growing lag at the pattern shops. Also textile machinery requirements are rather slow. However, demand is active for presses, paper making machinery, steel mill parts and an assortment of other requirements.

Steel foundries are operating five days a week with full working forces, with backlogs ranging around two months. Demand is diversified. Malleable foundries are doing well, particularly on pipe fittings. No little tonnage is going to manufacturers of trucks and builders hardware. Full normal operations are the general pattern.

ASTM Will Hold Its Annual Meeting in Atlantic City

Annual meeting of the American Society for Testing Materials will be held at Chalfonte-Haddon Hall, Atlantic City, N. J., on June 18-22. During the meeting 32 technical sessions including eight symposiums will take place. In addition, numerous committee meetings will be held.

On Tuesday noon a luncheon session is planned at which the president of the society will present his address, and various awards will be made. In the afternoon, D. K. Crampton, Chase Brass & Copper Co. Inc., Waterbury, Conn., will present the fifth Gillett Lecture on "Structural Chemistry and Metallurgy of Copper." Thirtieth Marburg Lecture will be held Wednesday afternoon at which C. E. Reed, General Electric Co., Waterford, N. Y., will speak on "Industrial Chemistry,

HERE'S PROOF... AND A PROMISE of increases in Service Life up to 100% with .....

WALSH MULLITEX SUPER DUTY FIRE BRICK

In non-ferrous melting operations, Mullitex, Dry Press Process, Missouri Quality Fire Brick has demonstrated its superiority by actually producing increases in service life up to 100%.* Not in one single instance on record has Mullitex failed to show an appreciable increase in length of service.

Isn't this the kind of performance you want in your rotary or stationary furnaces. The facts are all here for you. Write today for complete details.

*Names on request.

NOTE: And for added savings Mullitex Fire Brick laid up with Mullitex Extra Duty Cement is the *perfect combination.*

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for MORE and BETTER MOLDS...

you can't beat the MONARCH KWIK-STRIP MECHANICAL CORNER FLASK

actually OPENS and CLOSES with FINGERTIP EASE

Locking handle bolts work directly in a straight line. Handles can be placed in any one of four positions (up and down position shown above). Flask opens, closes and locks with positive straight line action of bolts. Binding on working corner is eliminated. Corner pin guides and springs are completely sealed against sand. All working parts are case hardened and cadmium plated. Draw pins are hard chrome plated, centerless ground and polished for true diameter. Forged and plated guide bushings. Cold Rolled wear strips are standard on top of cope and bottom of drag. Wear strips on parting flanges optional. Sides are flat so flask can be set on edge without danger of tipping.

Send for your copy of our new bulletin featuring Monarch KWIK-STRIP Flasks, Jackets, Upsets and Accessories.

CONSTRUCTION: Precision built from cast aluminum or magnesium. Made with the most modern jigs and fixtures and machine tools to insure accuracy.

AVAILABLE SIZES: 12" width x 4" depth to 30" width x 7" depth; 12" long x 4" depth to 30" long x 7" depth, in increments of one inch. Upsets available in 1" x 2" depths 4° and 5° tapers available.

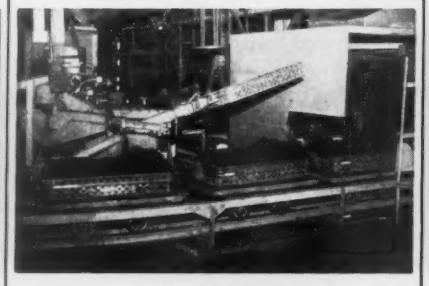
Cast aluminum or iron jackets available to fit all flask sizes listed above.

"Another Foundry product by"... **NEWAYGO** engineering company newaygo, michigan

FROM INDIVIDUAL UNITS TO COMPLETE SYSTEMS

our job is serving your sand handling needs better

COMPLETE SANDHANDLING SYSTEMS

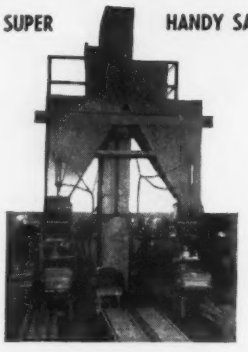


CAR CONVEYORS

PALLET TYPE CONVEYORS

REDDY SANDY

SUPER HANDY SANDY



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"Foundry Business is BIG Business"

NEWAYGO engineering company

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. . . and profitable too, with NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT

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MR. LEO J. GARDNER 19421 Story Road Cleveland 16, Ohio Telephone: Edison 1-1277	Ohio (all but N.W. corner) Western Pennsylvania West Virginia Covington, Kentucky
MR. A. N. VOLK 4352 North Keeler Avenue Chicago 41, Illinois Telephone: Avenue 3-0855	Illinois (northern half) Iowa, Minnesota Wisconsin
MR. O. H. KASTENS Newaygo Engineering Co. Newaygo Michigan Telephone: 3821	Indiana (northeastern) Michigan (southern half) Ohio (northwestern corner)
MR. G. E. MARCKRES 426 West Wabash Street Bluffton, Indiana Telephone: 1612-W	Indiana (all but northeastern section)
MR. R. W. FERGUSON Newaygo Engineering Co. Newaygo, Michigan Telephone: 3821	Michigan (northern half Michigan (Upper Peninsula)
NEWMAN FOUNDRY SUPPLY CO. 665 Pine Avenue P. O. Box 160 St. Lambert, Montreal 23, Quebec, Canada Telephone: Orchard 1-1926	Canada—Prov. of Ontario and Quebec, east of King- ston; New Brunswick, Nova Scotia and Prince Edward Island
WARK FDRY. EQUIP. CO. P. O. Box 2308, Hiler Br. Kenmore, New York Telephone: Riverside 4469	New York State (except Metropolitan New York) Pennsylvania (northwest)
DON BARNES FDRY. SUPPLIES & EQUIP. 605 James Street North Hamilton, Ontario, Canada Telephone: Jackson 7-7436	Canada—Prov. of Manitoba and Ontario east to Kingston
MR. C. H. PALMER, Jr. 32 Tamarack Lane Levittown, Pennsylvania Telephone: Windsor 5-1508	Metropolitan New York New Jersey, Delaware Maryland, Washington, D.C. Pennsylvania (central) Virginia, North Carolina, South Carolina
MR. L. C. (Carl) BEERS 19021 Hillcrest Blvd. Birmingham, Michigan Telephone: Midwest 4-7798	Special representative in the Detroit Area
MR. R. J. BRANDT N. E.—Brandt Co. Cocheco Avenue Branford, Connecticut Telephone: Hubbard 8-2143	Connecticut, Vermont Maine, Massachusetts New Hampshire Rhode Island

Properties and Applications of Silicones."

Technical sessions and committee reports will include those on metals, both cast and wrought; fatigue and testing. An exhibit of testing and scientific apparatus and laboratory supplies will be held in connection with the meeting.

National Castings Council Holds Annual Election

Paul L. Arnold, resident manager, U. S. Pipe & Foundry Co., Chattanooga, Tenn., and president, National Foundry Association, was elected president of the National Castings Council at the annual meeting of the organization, held in Atlantic City May 7.

Thomas Rutherford, district sales manager, Midvale Co., Philadelphia, and president, Alloy Casting Institute, was named vice president; F.

PAUL L. ARNOLD

THOMAS RUTHERFORD

Ray Fleig, president, Smith Facing & Supply Co., Cleveland, was re-elected treasurer; and Frank G.

F. RAY FLEIG

FRANK G. STEINEBACH

Steinebach, FOUNDRY, was re-elected secretary.

Program of the annual meeting was concerned with the preparation of information on the industry for the Business and Defense Services Administration of the Department of Commerce, also with the situation resulting from the unrestricted exportation of excellent ferrous scrap, and other activities of various segments of the foundry industry.

You wouldn't know they're safety spectacles until they're needed!

NOW—WILLSON DESIGN provides this *new concept* of style combined with protection—ideal for day-long wear!

You'll see a dramatic difference in this protective eyewear that's styled for greatest worker acceptance! New *wide-vision* lenses. New popular plastic frame styles. New designs that add distinctiveness to safety spectacles at last!

Workers will wear them willingly—with the Willson "Super-Tough" lenses prescription ground, if desired—because these new styles are as handsome as frames can be!

A full range of eye, bridge and temple sizes have been developed into attractive eyewear by the Willson Research Center. Ask your Willson distributor to show you the WF line soon.

Style WF

new wide-vision frame shape in flesh-color butyrate; spatula or half plastic-half cable temples

Style WFD

demi-amber wide-vision butyrate frame; matching spatula temples

Style WFB

popular Willson Bronze, wide-vision frame; spatula or half plastic-half cable temples

Style WFH

wide vision lenses, spatula temples—in new half-frame design (demi-amber overlay on upper half of crystal butyrate frame)

Over 300 safety products carry this world-famous trademark

WILLSON PRODUCTS DIVISION RAY-O-VAC COMPANY

237 Washington Street, Reading, Pennsylvania

The

SNAGGING WITH THE "TOUCH OF GOLD." You save time and money on countless cleaning room jobs when your portables are equipped with fast-cutting, easy-to-handle Norton B-11 resinoid bonded wheels.

FAST WORK IN THE CORNERS. Any cone will get *into* spots like this. But a B-11 cone will get *out* faster, thanks to the stepped-up grinding action derived from its great new resinoid bond.

B-11 RESINOID BOND

...a powerful plus for portables

New Norton bond adds the "TOUCH of GOLD" that improves snagging performance, reduces operator fatigue, cuts cleaning room costs

The B-11 resinoid bond is a typical example of how Norton is constantly advancing grinding wheel manufacture and performance.

Wheels made with it have more efficient cutting action, more uniform structure and better balance — plusses that pay off on every snagging job.

On your portables, for example, B-11 wheels "hug that work" closer, grind faster, with less vibration and bounce. That means less operator fatigue, longer wheel life — and more metal ground off for every dollar you put into B-11 wheels.

Easier to Choose

Since the one B-11 bond includes a wide range of hardness grades, you no longer need to make the grade conversions required when changing from one resinoid bond type to another. Hardness increments are evenly spaced throughout the entire grade scale. And to make it even easier for you to choose exactly the right wheel for every job, B-11 wheels are made in half-grade increments. For example, if grade P is too soft and grade Q too hard, you can specify P+ exactly half way between P and Q. And B-11 construction assures exact duplication with every re-order.

Your Norton Distributor

will gladly arrange test runs of B-11 resinoid wheels in your plant. Or write to the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1712

DOUBLE PROTECTION. A B-11 flaring cup wheel with rotating guard. Insert shows the guard and the pronged-anchor steel bushing molded into the back of Norton cup wheels. With the B-11's better balance, you get the ideal combination for easier, safer snagging.

NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels Grinding Machines • Refractories

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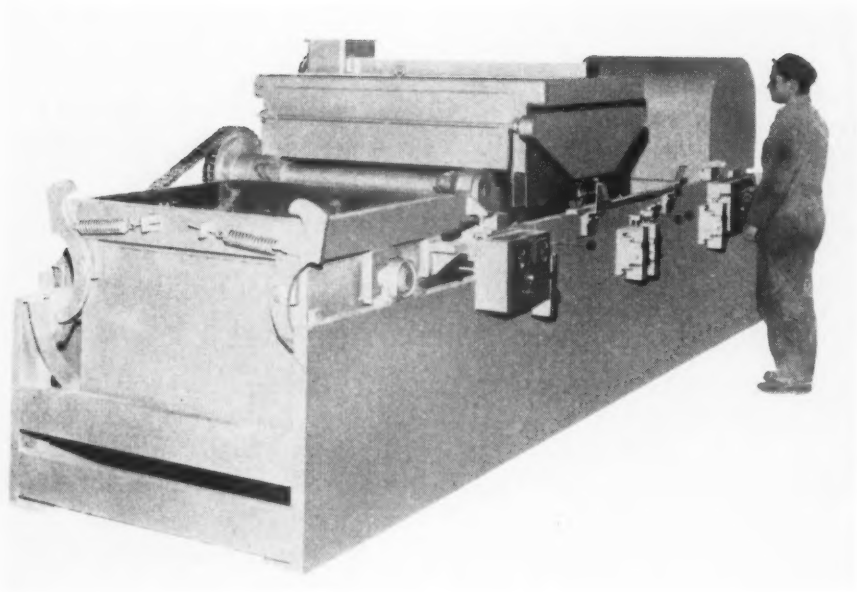
For more information, use Reader Service Card, page 229

New Equipment and Supplies



Large Shell Machine

is 2-station unit featuring 36 x 36-in. pattern plates

Shallway Corp., Ninth and West Crawford, Connellsville, Pa.—Large shell molding machine reportedly will produce castings up to 34 in. square and smaller castings arranged in multiple patterns on two 36 x 36-in. pattern plates. Machine produces 70 shells or 35 complete molds per hour. Unit uses hydraulic motors to invert the pattern plates and dump boxes during the investment cycle. Shells are ejected by hydraulically-operated plates. Oven moves back and forth by electric power. In one operation, castings presently being made in the 3 ft sq mold weigh 720 lb after removal of gates and runners.

For More Details Circle No. 501—Page 229

Diecasting Machine

for zinc or aluminum has rapid operating cycle

Kux Machine Co., 6729 North Ridge Ave., Chicago 26, Ill.—Large 1000-ton diecasting machine weighs 79,000 lb and uses 10-in.-thick solid steel die plates each weighing over 10,000 lb. These plates measure 54 x 72 in. and provide die space of 32 x 40-in. clearance between tie bars. Die opening is 24 in., completely adjustable for less stroke if desired. Machine is made in both hot and cold chamber models. The unit's hydraulic system is capable of putting the machine through eight free cycles per minute with injection pressures up to 32,000 psi and injection speeds up to 1000 fpm. Up to 49 lb of zinc and more than 14 lb of aluminum can be injected into the die with only the movement of electric pushbuttons required for a fully automatic cycle.

For More Details Circle No. 502—Page 229

Corebreaker

produces a powerful blow with minimum vibration

Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis.—Corebreaker weighs 22 lb and is 19 in. long. Manufacturer reports it is easy to hold and operate. Operator fatigue and maintenance costs are minimized by use of an air-cushion piston hammer, which produces a powerful blow with little vibration. Corebreaker operates on 80 to 95 psi and uses little air. One-bolt retainer construction simplifies and speeds chisel changes. Chuck size is ⅞-in. hexagon round x 3¼ in.

For More Details Circle No. 503—Page 229

Heavy-Duty Conveyors

are portable and designed for use under severe conditions

Cooney Industries Inc., 17245 East 10 Mile Rd., East Detroit, Mich.—Conveyors are equipped with a heavy-duty wire mesh belt and designed to handle hot objects, heavy objects with slick surfaces or heavy objects of awkward shape. Conveyor is supplied with casters and handles placed on each side to provide ease of handling when tilting or rolling from one location to another. Wire mesh is available in a variety of weaves and with any spacing and size of flight. Motors can be had in all standard voltages to meet requirements.

For More Details Circle No. 504—Page 229

Silicate Binder

for molds and cores departs from conventional formulas

Delhi Foundry Sand Co., 6326 River Rd., Cincinnati 33, O.—Silicate-base sand binder for use in molds and cores is said to have a number of advantages as a bond. These include no separation in storage, low viscosity permitting easy mixing, good bench life, excellent gas reaction, good storage life of finished cores and good collapsibility. When

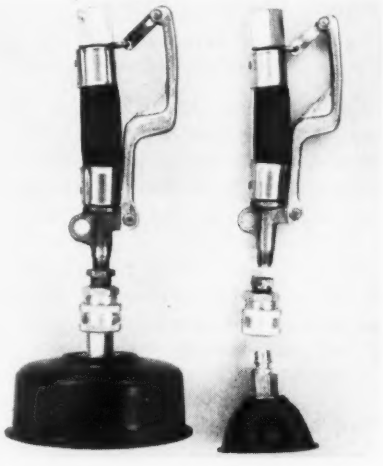
desirable, small to medium-size cores made with binder can be cured in ovens but in general practice baking or drying operations are eliminated.

For More Details Circle No. 505—Page 229

Pressure Control Valve

can be used as a corewash gun or as a CO_2 applicator

Flex-Rite Valve & Mfg. Co., P. O. Box 1855, Tulsa, Okla.—Air valves contain a tetrafluoroethylene resin



valve seat that assures positive pressure control and allows operator to use as little or as much air pressure as the job requires. When fitted with short tips, the valves can be used for spraying both corewash and parting liquids. When fitted with rubber cup attachments, the valves can be used in applying CO_2 to cores or molds. One model is made with a flexible unit ½-in. ID and ⅜-in. hose fittings which may be bushed to ¼-in. Another model is made with a flexible unit ⅜-in. ID and ¼-in. hose fittings.

For More Details Circle No. 506—Page 229

Overhead Crane

has infinite variable speed control under any load

Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore Inc., Muskegon, Mich.—All-hydraulic, 3-ton overhead traveling crane provides infinite variable speed under load and is claimed to require reduced maintenance because use of hydraulics eliminates complicated electric mechanisms. Designs have been completed for cranes up to 10 ton capacity. Power for each of the crane motions, hoist, trolley travel and bridge travel is supplied by a single constant delivery, vane type hydraulic pump driven by a 10-hp squirrel-cage type single speed motor.

For More Details Circle No. 507—Page 229

Magnetic Vibrators

use no rectifiers and operate at 3600 vibrations per minute

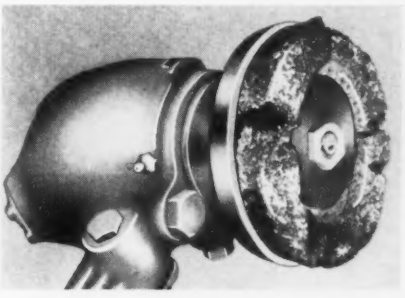
Eriez Mfg. Co., Erie, Pa.—Unit vibrator combines an AC electromagnet and a permanent magnetic unit. It operates at 3600 vibrations per minute and requires no rectifiers. A rhythmic action is transmitted to bins, hoppers or chutes handling dry materials in lump or powdered form to assure free and even flow at all times. Two models are available: One is designed for bins of 7 cu ft capacity and up to 1/16-in. wall thickness and the other is for bins of 20 cu ft capacity and up to 3/16-in. wall thickness.

For More Details Circle No. 508—Page 229

Safety Flange

for use on portable grinders minimizes accident hazards

West Industries Inc., Dept. A, 19218 Redwood Rd., Cleveland 10, O.—Safety flange for use on portable



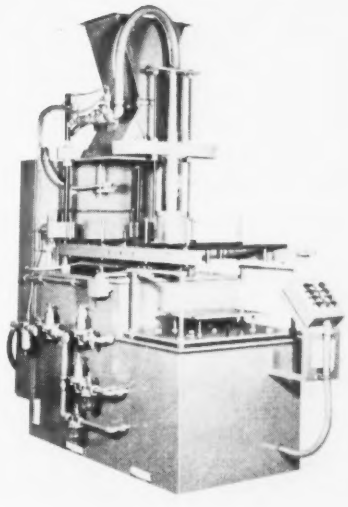
surface grinders is designed to clamp the grinding wheel in place so that broken pieces will not be thrown out should the wheel break. Flange consists of a locking nut and a serrated flange of steel that is keyed or threaded on the grinder shaft. No modification of standard portable pneumatic or electric grinders is re-

Shell Blower Is Rated at 120 Blows Per Hour

SHELL CORES OR MOLDS are ready for use within 30 seconds after resin-coated sand has been blown into electrically heated boxes on two-station, rotary, automatic shell blower. Flexibility is such that hollow cores, solid cores, contoured shell molds or liner cores can be made with the machine. Cores up to 15 x 20 x 36 in. in height or molds up to 16 x 22 x 15 in. draw can be made.

Special features of the machine include vertical or horizontal parting fixtures to handle hot core or mold boxes; hydraulic system with cam controls for rotations and positive indexing; contactor panel for maintaining constant and uniform temperature controls; interlocked electrical operations while pneumatic operations are speed controlled. Semiautomatic or full automatic operations are controlled from a single pushbutton control panel located at the front of the machine.

Two stations operate 180 degrees from each other and one operator



runs machine from a single station. Production rates up to 120 blows per hour are reported. Machine weighs about 5000 lb, occupies 36 sq ft and is manufactured by C & S Products Co., 12733 Fullerton, Detroit 27, Mich.

For More Details Circle No. 551—Page 229

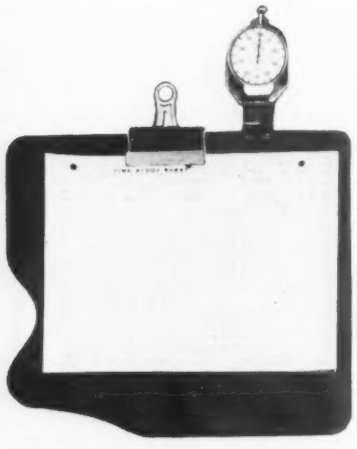
quired. At present, 4, 5 and 6-in. cup wheel flanges and 6-in. straight side cup wheel flanges are being made.

For More Details Circle No. 509—Page 229

Time Study Board

is light, strong and contains a removable stopwatch holder

M. Ducommun Co., 580 Fifth Ave., New York 36, N. Y.—Time study board with removable stopwatch



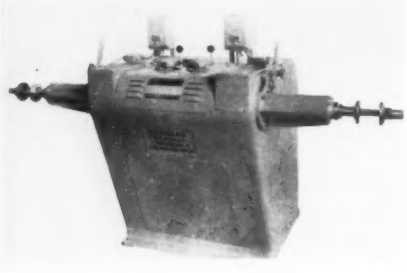
holder is satin finish, smooth, black nonbreakable plastic and claimed to be light, strong and warp resistant. Board measures 12 x 13 x ⅛-in. Arm and body cut-outs are provided. Stopwatch holder is of pressed steel, triple-plated (copper, nickel, chrome) with a direct, one screw adjustment. Any make of stopwatch of average size can be used. Once clamp is adjusted, it is claimed the watch cannot move. Watch can be wound without removing from holder.

For More Details Circle No. 510—Page 229

Polishing Lathe

has variable speeds available to two independent spindles

Hammond Machinery Builders Inc., Dept. 1604, Kalamazoo, Mich.—Two-spindle, variable-speed buffing and



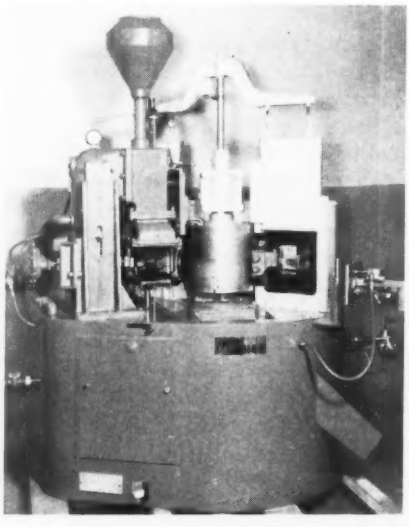
polishing lathe has a swing of 20 in. from side of base to face of inner flange. Two spindles operate independently, each having its own motor and variable-speed control which permits each operator to change wheels or vary speeds without interfering with or causing down-time to the other. Each operator has 5, 7½ or 10 hp on each wheel. Spindle speeds can be changed while lathe is running.

For More Details Circle No. 511—Page 229

Shell Coreblower

is said to be vastly improved over previous machines

Shell Process Inc., McKinstry Ave., Chicopee, Mass.—Shell coreblower has undergone several changes that manufacturer claims improves its performance. New, larger blow head is adjustable up or down for quick positioning to varied corebox heights. Stainless steel-lined cast iron oven doors open and close precisely in guides. Coreboxes rotate through cycle on ball bearings and heavy bearing center post assembly. Corebox holders have been changed to



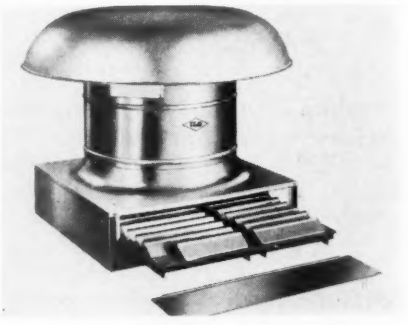
reduce time required for corebox changes. Positioning mechanism has been redesigned to assure exact location of box at blow and ejection station. Automatic heat control instrument has been added for fine adjustment of gas flame for various size cores and coreboxes.

For More Details Circle No. 512—Page 229

Roof Ventilator

offers high efficiency, reduced maintenance and long life

Ilg Electric Ventilator Co., 2850 North Pulaski Rd., Chicago 41, Ill.—Roof ventilators in five sizes with high and low speed models are designed to meet a variety of requirements on commercial and industrial buildings. Unit has a low silhouette and is shipped completely assembled and enclosed in an aluminum housing that does not need painting. Propeller fan and permanent split capacitor type motor are direct-connected. All electrical connections are in a



mounting saddle on the outside of the housing. Fan wheel is statically and dynamically balanced.

For More Details Circle No. 513—Page 229

Lithium Metal

can be used as an alloy, scavenger or degasifier

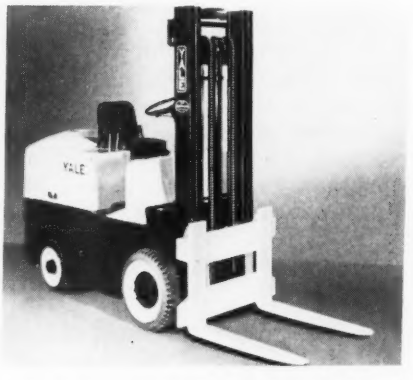
Foote Mineral Co., 18 West Chelten Ave., Philadelphia 44, Pa.—Lithium metal for use as an alloy for nonferrous metals and as a scavenger and degasifier in both ferrous and nonferrous applications. Material is offered in 1-lb ingots packed under oil in sealed steel cans. Typical analysis is 99.8 per cent Li.

For More Details Circle No. 514—Page 229

Fork Lift Trucks

incorporate new engineering and design features

Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa.—Redesigned line of fork lift trucks



—including gasoline, LP-gas, diesel and electric powered models—features fully automatic torque converter transmissions, self-adjusting brakes, power steering and high travel and lifting speeds. Lower silhouette lines, a clear floorboard, waterproof instruments grouped in a lowered cowl and a recessed driver's seat are other innovations. Operator visibility reportedly is improved

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601. Grinding Wheels

Grinding Wheel Division, Electro Refractories & Abrasives Corp., 344 Delaware Ave., Buffalo, N. Y.—Bulletin T-855 covers grinding wheels for use on tools and cutters as well as wheel specifications for tool room applications. Bulletin highlights economies which can be effected through use of resin-bonded wheels in grinding tungsten carbide and high speed steel cutters.

602. Shell Mold Silicones

Silicones Division, Union Carbide & Carbon Corp., 30 East 42nd St., New York 17, N. Y.—Three silicones reportedly effective as release agents in shell mold manufacture are described in booklet, "Silicones for the Shell Molding Process."

603. Metallurgical Carbon

Barnebey-Cheney Co., Cassady at 8th Ave., Columbus, O.—Bulletin J-35 discusses chemical and physical characteristics of metallurgical carbons, detailing in tabular form the grades, elemental contents of their carbons, available mesh sizes of each, cubic feet per pound and other data.

604. Molding Machines

Beardsley & Piper Division, Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39, Ill.—Specifications, construction features and engineering data pertinent to line of molding machines of various capacities are found in bulletin 5111.

605. Core Ovens

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.—Folder points out advantages of dielectric corebaking and includes several in-use photographs of company's ovens in operation.

606. Alloy Charts

R. Lavin & Sons Inc., 3426 South Kedzie Ave., Chicago 23, Ill.—Vol. 12, No. 1-2 of *The Lavingot News and Views* presents a series of charts containing essential data to nonferrous ingot and casting alloys. Charts include specification numbers, chemical compositions, mechanical properties and test bar designs.

607. Sieves

Soiltest Inc., 4711 West North Ave., Chicago 39, Ill.—Folder offers general information, prices and sizes of sieves, sieve shakers, testing screen and accessories used in sizing dry materials.

608. Exhaust Systems

Crucible Manufacturers' Association, 11 West 42nd St., New York 36, N. Y.—No. 6 in series on "Getting the Most from Crucible Melting," covers exhaust systems, their various types, functions and designs.

609. Industrial Noise

Architectural Products Division, Burgess-Manning Corp., 5970 Northwest Highway, Chicago, Ill.—Bulle-

ADVERTISED PRODUCTS and SERVICES — **June 1956**

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tins A-137 and A-140 deal with current industrial noise problems. The former tells how accurate audiograms can be obtained in employee hearing tests and the latter relates developments incorporated into the company's doorless telephone booth.

610. Moisture Control

Hankison Corp., 540 Biltmore Bldg., Pittsburgh 16, Pa.—Booklet, "The Dew Point Story," explains in nontechnical language the terms "dew point, relative humidity and saturation point." A typical plant compressed air system is described and a method of eliminating moisture vapor from compressed air is explained.

611. Plunger Rings

Precision Piston Rings Inc., Dept. DC-527, 1417-23 Commerce Ave., Indianapolis, Ind. — Folder describes properties and features of unbreakable wrought alloy stainless steel piston rings for die casting machine plungers. Rings are developed to withstand temperatures to 1200°F.

612. Compressor

Cooper - Bessemer Corp., Mount Vernon, O.—Engineering catalog F-80 describes a reciprocating compressor available with either single or twin frames, with single or multistage cylinders. Ratings are up to 600 hp as belt-driven or completely "packaged" unit.

613. Speed Variator

Cleveland Worm & Gear Co., Speed Variator Division, 3293 East 80th St., Cleveland 4, O.—Advantages, engineering features, in-use applications and general information on a compact drive that provides infinitely variable output speed over a range up to 9:1 from a constant speed power source are found in folder.

614. Wire Rope

American Cable Division, American Chain & Cable Co., Wilkes-Barre, Pa.—Bulletin DH-128D presents recommendations covering more than 120 different types of wire rope used in industrial service. Each recommendation covers rope diameters, construction, preforming, lay, grade and core. Charts covering weights and breaking strengths are provided as are photographs and drawings of typical wire rope riggings and accessories.

615. Steel Floor Armor

Klemp Metal Grating Corp., 6601 South Melvina Ave., Chicago 38, Ill. —Application, installation and specification information on steel floor armor is found in booklet. Armor is designed to take brunt of rolling loads and to increase life of industrial floors.

616. Cutting Tools

M. A. Ford Mfg. Co., 732 West River St., Davenport, Iowa—Listing of styles, shapes, sizes, dimensions, angles and operating data on carbide rotary files and cutters, countersinks, end mills and special cutting tools are found in catalog 601.

617. Spectrochemical Analysis

National Spectrographic Laboratories Inc., 6300 Euclid Ave., Cleveland 3, O.—Brochure suitable for framing illustrates graphically the scope of the science of spectroscopy and the steps involved from sample preparation through the recording of line spectra on film and subsequent interpretation.

618. Industrial Lighting

RLM Standards Institute Inc., 326 West Madison St., Chicago 6, Ill.—Revised standard specifications for industrial lighting units contain new specifications on both incandescent and fluorescent industrial units as well as new lighting data of value to specifiers.

619. Hand Pump

Bowser Inc., 1300 East Creighton Ave., Fort Wayne, Ind.—Bulletin 3011 covers operation and performance of a piston type, positive displacement, self-priming hand pump that delivers 20 gpm. Pump may be installed in pipe line or drum.

620. Induction Heaters

General Electric Co., Schenectady 5, N. Y.—Specifications, dimensions, operating information, design features and ratings of electronic induction heaters are found in bulletin GEA-6388.

621. Rider Trucks

Lewis-Shepard Products Inc., Dept. R-16, Watertown, Mass. — Photographs, drawings, specifications and descriptive information on rider trucks with capacities up to 4000 lb are found in circular 35F.

622. Carbides and Nitrides

Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y.—Bulletin Cdb-7, "Refractory Molybdenum Carbides and Nitrides," summarizes applications; physical, chemical and mechanical properties and preparation of molybdenum carbides and nitrides.

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623. Hand Files

Grobet File Co. of America, Carlstadt, N. J.—Bulletin 356 shows production line use of precision hand files and illustrates techniques necessary to insure accuracy of small production parts. A wide selection of files is cataloged.

624. Ferro Alloys

Vanadium Corp. of America, 420 Lexington Ave., New York 17, N. Y. —Fiftieth anniversary booklet briefly covers the company's history and its operations in mining, milling and smelting ferro alloys as raw materials for the metals industry.

625. Rust Prevention

Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill.—Form 255 is a general catalog on rust prevention with information and 102 color chips showing colors available in company's rust preventive primers and coatings.

626. Colloidal Dispersions

Acheson Colloids Co., Port Huron, Mich.—Bulletin 425 tells how colloidal dispersions can help increase production, reduce costs and improve quality of product in permanent mold, die and sand casting operations.

627. Safety Equipment

Fibre-Metal Products Co., Chester, Pa.—Welding helmets, hand shields, electrode holders, face shields and screens, leather and asbestos safety specialties, goggles, filter and safety glass and other welding and industrial safety products are covered in catalog 24.

628. Crane Electrification

Insul-8-Corp., 1369 Industrial Rd., San Carlos, Calif.—Company's systems of mobile safety electrification for cranes, monorails and moving machinery are detailed in catalog. Photos, descriptions, engineering data, installation procedure and other pertinent information are provided.

629. Solenoid Valves

Atkomatic Valve Co., 545 West Abbott St., Indianapolis, Ind.—Catalog 200 contains dimensions, specifications, pressures and applications of electrically operated two-way solenoid valves for air, gas, steam and liquid flow control.

630. Brass Die Castings

Titan Metal Mfg. Co., Bellefonte, Pa.—Folder provides design data on uses of brass pressure die castings as fabricated assembly parts. Compositions and properties of castings are given.

631. Drum Handling Equipment

Morse Mfg. Co., 727 Manlius St., East Syracuse 1, N. Y.—Folder 1255 describes manual and motorized drum handling equipment including drum cradles, lifting hooks, hand trucks, tipping levers and rotators.

632. Industrial Fire Hose

B. F. Goodrich Co., Industrial Products Division, Akron, O. — Folder 3740 shows cutaway views of hose construction in pointing out advantages of several types of fire hose. Operating data and specifications of each kind of hose are included.

633. Work Benches

Pollard Bros. Mfg. Co., 5508 Northwest Highway, Chicago 30, Ill.—Catalog 304 presents work benches for individual or continuous applications in 126 different combinations. Three basic styles are available with variations in top sizes and heights.

634. Rubber Goods

Hamilton Rubber Mfg. Corp., Trenton 3, N. J.—Sizes, weights, applications, construction features and other pertinent information on industrial and mechanical rubber goods are found in catalog.

635. Control Systems

Automatic Temperature Control Co., 5200 Pulaski Ave., Philadelphia 44, Pa.—Catalog D-31 provides a picture of products and services

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ADVERTISED PRODUCTS and SERVICES — **June 1956**

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offered for the field of automation. Differential transducer control and automation systems, time control equipment including electronic, equipment operator mechanisms, valves, counters and electronic contactors are among the items covered.

636. Induction Heater

Lindberg Engineering Co., 2321 West Hubbard St., Chicago 12, Ill.—Folder presents case history of two-station high frequency induction heating unit that reportedly provides operating economies that will repay its original cost in less than two years.

637. Fluid Power

National Fluid Power Association, Evanston, Ill.—Booklet, "How Fluid Power Serves Industry and You," is written to help the reader recognize fluid power at work, better understand how it works, sense its significance and ever-presence.

638. Lubricant

Protecto-Lube Co., 2832 East Grand Blvd., Detroit 11, Mich.—All-purpose lubricant is suggested for conveyors, bearings, slides, gaskets, packing, gears, shafts, guide pins, die sections, valves and stems and machine ways.

639. Humidity Recorders

Bristol Co., Waterbury 20, Conn.—Portable recorders for relative humidity and temperature are illustrated and described in bulletin H1008.

640. Gamma Radiography

Picker X-Ray Corp., 25 South Broadway, White Plains, N. Y. — Booklet provides answers to basic questions about gamma radiography as a method of nondestructive testing. Information on principles, applications and equipment is provided.

641. Diecasting Alloys

Henning Bros. & Smith, 91-127 Scott Ave., Brooklyn 37, N. Y.—Reference book on zinc-base diecasting alloys describes the requirements for a diecasting alloy for diecasters, engineers and designers. Composition and limits, chemical requirements, mechanical requirements and properties are shown in chart form.

642. Silver Cloth Tape

Permacel Tape Corp., New Brunswick, N. J.—Brochure describes how silver cloth tape aids in duct installation. Material is water and moisture resistant and is said to provide an effective seal against air leaks and dust.

643. Molybdenum

Climax Molybdenum, 500 Fifth Ave., New York 36, N. Y.—"Moly Iron Castings—#2," discusses the compatibility of molybdenum with foundry operations and its effect as an alloying element in operations using a single base iron.

644. Slings

Macwhyte Co., Sling Dept., Kenosha, Wis.—Bulletin 5308-R lists the safe loads for slings of 20 sizes of wire rope when used at various angles of application. Loads covered range from ½ to 48.7 tons.

645. Work Simplification

Industrial Management Society, 35 East Wacker Dr., Chicago 1, Ill.—Folder, "Work Simplification on Film," lists 38 films on work simplification in industry. Films have been produced by leading American firms and are available for rental. Films run about 10 to 15 minutes and picture "before" and "after" operations.

646. Excitation Unit

Jarrell-Ash Co., 26 Farwell St., Newtonville, Mass.—Catalog V2-56 contains descriptions of several excitation units for spectrochemical analysis including detailed information on the circuit parameters.

647. Control Valves

Valvair Corp., 454 Morgan Ave., Akron 11, O.—Service tables, pressure ranges, condensed specifications, dimensions, features and operating details of single and double solenoid valves are found in bulletin SK356.

648. Gearmotors

Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, O.—Line of gearmotors incorporating new NEMA motors and redesigned gearheads is presented in bulletin E-2408.

649. Lamps

Large Lamp Dept., General Electric Co., Cleveland 12, O. — Lamp bulletin LD-1 is a 79-page text on the design and operation of incandescent, mercury and fluorescent light sources.

650. Laboratory Apparatus

Arthur S. LaPine & Co., 6001 South Knox Ave., Chicago 29, Ill.—*Apparatus Review No.* 6 describes and illustrates company's laboratory apparatus.

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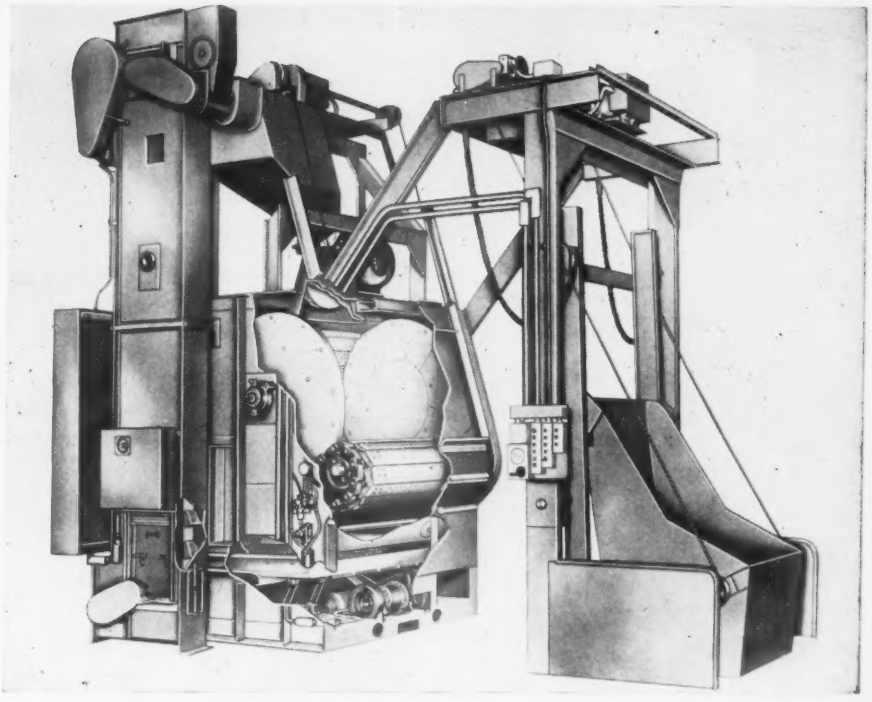
New Castings Cleaning Machine Has Many Improvements

TWO YEARS of developmental work have gone into a new tumbling type airless blast cleaning machine made by Wheelabrator Corp., Mishawaka, Ind. The machine features greater castings cleaning efficiency, increased service life and simplified maintenance.

Abrasive throwing capacity of the centrifugal wheel is more than twice that of similarly sized wheels in older company models—830 lb of abrasive per minute compared with 390 lb. Because of the greater amount of abrasive hitting the work and the more uniform pattern of its distribution in the chamber, cleaning speed and efficiency is improved. Patented alloy steel wheel blades have been redesigned for longer wear. They are held in place by an easily inserted spring device which eliminates strain and stripped threads encountered with set screws. Wheel maintenance also is simplified by use of an easy-access wheel guard housing and a revised system of guard liners.



A major contributor to the machine's efficiency and durability is the new separator which removes sand and other contaminants from the abrasive. Essentially it is a 60-in.-wide double-deck vibrating conveyor located below and to the back of the cleaning chamber at floor level where it is accessible for quick maintenance. The upper, screen deck removes large contaminants; the lower, pan deck feeds good abrasive and small refuse off the end in a uniform curtain for air separation. Air is drawn through the curtain and into a 60-in.-wide slot, carrying the small contaminants with it. Beyond the slot—a distance of 2 or 3 in.—the air expands into a chamber, loses most of its velocity and drops the contaminants to a screw conveyor which feeds them to a container.

The abrasive falls from the vibrating pan to another screw conveyor and is moved to a bucket for deposit into the hopper, supplying the centrifugal wheel. Efficiency of the separator is three times better than that of earlier designs.

Super-tight construction of the cleaning chamber and powered chamber door practically eliminates jamming of work and loss of abrasive. Special alloy flights of the endless conveyor overlap and are in contact with each other continuously so that at no time during their travel in the work area is there space between them. Space between ends of the flights and the barrel head is only about 1/16-in. Guards between barrel heads and the mill are independent of the door frame so that work can not interfere with operation of the door. Bottom portion of the door of the cleaning chamber is operated automatically by an air cylinder actuated by the mill driving mechanism. It is always in closed position except when work is being unloaded.

Jamming of the chain drive is prevented by use of hardened traction wheels instead of sprockets on all but the drive shaft. Redesigned steel links and pins increase chain life.

The machine has an operating load capacity of 28 cu ft. Normal weight load of ferrous castings is 2500 to 3500 lb although the machine has handled as much as 5600 lb. Castings with exposed sections as thin as ¼-in. have been cleaned without damage or jamming of the machine. Production castings 30 in. long also have been cleaned successfully.

Continued, trouble-free operation claimed for the machine plus availability of automatic, sequenced operation through all cycles, adapts the machine to use in automated production installations.

For More Details Circle No. 552—Page 229

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by a new upright assembly in which the hydraulic hose is concealed within the channels and by locating the driver's seat to the left of the truck's cylinder. Capacities up to 10,000 lb can be provided.

For More Details Circle No. 515—Page 229

Sound Analyzer

measures, analyzes and interprets industrial noise levels

Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.—Portable, precision instrument is for measurement and analysis of industrial noises. Instrument is contained in a single case 7 x 7¾ x 16 in. and weighs about 20 lb. All control dials are located on one panel and readings are indicated by a single meter. The function of the instrument is to determine whether a noise hazard exists and to locate the sources. Measurement range is from 24 db, about that of a very quiet home, to 150 db which is considerably higher in sound pressure than that which is developed by an air raid siren.

For More Details Circle No. 516—Page 229

Rubber Gloves

are designed to fit virtually any industrial application

Pioneer Rubber Co., 296 Tiffin Rd., Willard, O.—Industrial gloves are made of neoprene-coated flannel in three different weights—light, industrial and heavy duty. There is a choice of knit wrist and 12, 14½ and 18-in. gauntlet styles. Light and industrial weight gloves are available in black and heavy-duty gloves in mahogany red with nonslip finish on palms and fingers. Gloves are suggested for use on any job where

Doctor FOSECO, STMMMD*

CASE NO. 1861
PATIENT Sick, costly casting
DOCTOR Doctor FOSECO, STMMMD*
SYMPTOMS Large feeding heads, shrinkage, high cleaning costs.
"Hmmm, here's another case, same old trouble."
STMMMD
"Hmmmm, pretty bad shape alright!"
"Hmmmmm - - - "
FEEDEX
"This'll fix him up!"
"Wow! We've never had a casting like that before!"

CASE NO. 1861

PATIENT Sick, costly casting
DOCTOR Doctor FOSECO, STMMMD*
TREATMENT FOSECO FEEDEX®

RESULTS WOW! He's the healthiest casting there ever was. And he actually costs less 'cause his feeding head is smaller. He even costs less to clean and his skin is *so* smooth.

FEEDEX® (fēd 'ĕx) — A moldable exothermic anti-piping compound for increased feeding efficiency. Made of strongly heat-producing materials. Mixed with water and molded into shapes such as sleeves for lining the inside of risers in molds, etc.

Feedex is ignited by the metal entering the riser and sets off an exothermic reaction keeping the head-metal liquid and open for a much longer time to the feeding action exerted by atmospheric pressure. Heat loss is reduced as the insulating properties of the burned out material are greater than those of molding sand.

ADVANTAGES — Feeding efficiency increased, size of risers reduced; with correct use, casting yields are in the region of 80% to 90%.

Reduction of head size means: more castings produced from the same melting capacity; castings on which it is difficult to provide adequate heads due to design can be produced sound and free from shrinkage porosity; reduced cleaning costs.

Feedex is not confined to sleeve application. When molded it can be applied at any position in the mold, helping to obtain directional solidification.

✱ ***Scientific Treatment of Molten Metals, Molds and Dies***

For more information just call or write. You'll get action, fast!

FOUNDRY SERVICES, INC.
2000 BRUCK STREET COLUMBUS 7, OHIO

FEEDEX is a material especially made and adapted for use in making sleeves and related shapes covered by U. S. Patent No. 2591105.

resistance to abrasion and chemicals is important; where gloves will encounter acids, caustics, solvents, greases or oil; for handling wood, concrete, clay products or metals during forming, grinding, warehousing, shipping or similar operations.

For More Details Circle No. 517—Page 229

Heavy Duty Grinder

with built-in dust collector occupies minimum floor space

Standard Electrical Tool Co., 2507 River Rd., Cincinnati 4, O.—Heavy-duty grinder has a dust control system built inside the base to minimize overall floor space required by the machine. Motor driven material handling fan operates simultaneously with the grinder motor. Dust collecting chamber has a gravity feed of collected materials to a removable dust drawer. One model has a 2-hp motor serving two 2 x 12 in. wheels. Another model has a 3-hp motor powering two 2½ x 14 in. wheels. Wheels are protected by safety guards adjustable to wear of the wheels. Each guard contains a 4-in. diam exhaust outlet, hinged door, spark breaker and work rest.

For More Details Circle No. 518—Page 229

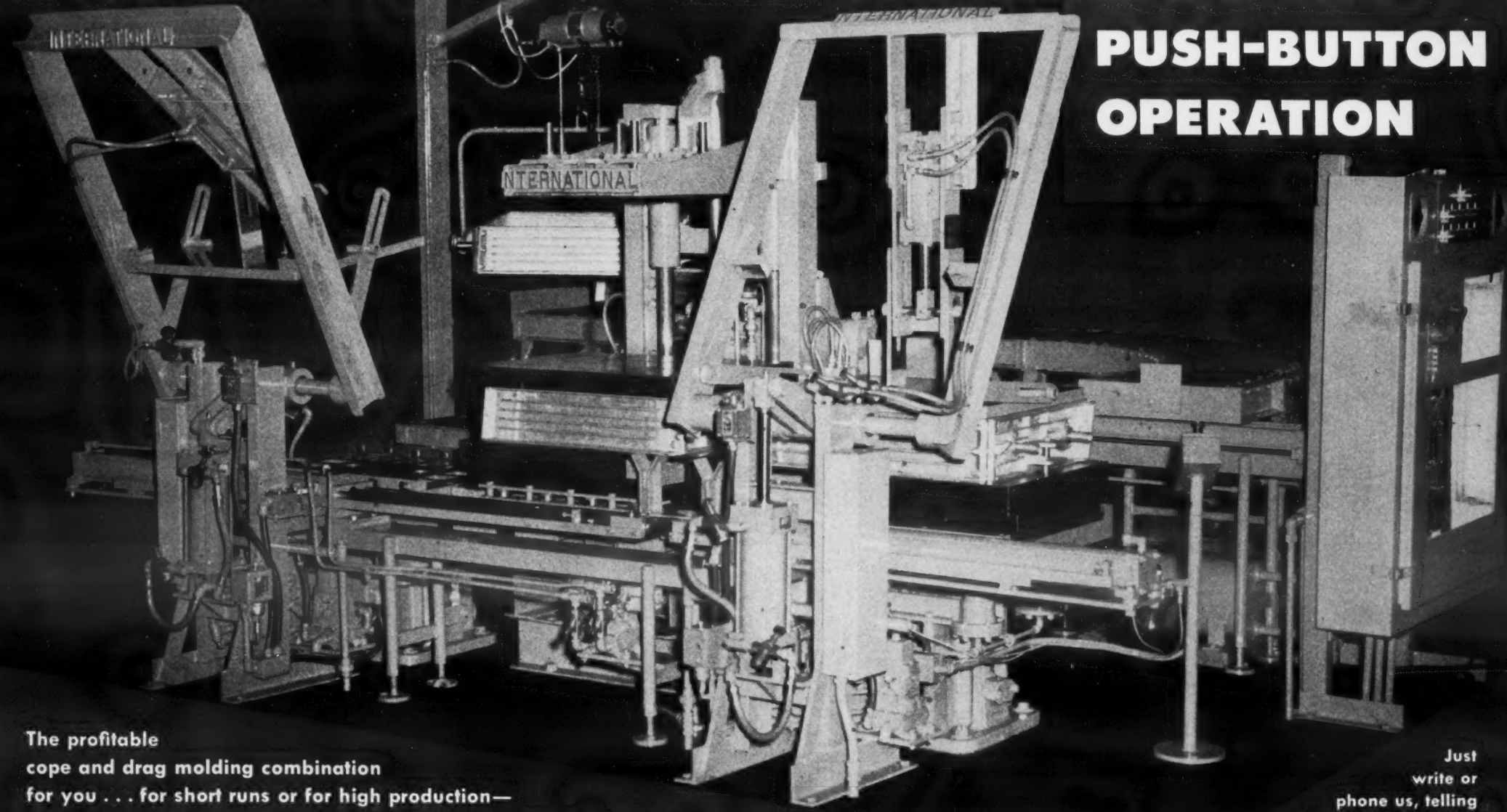
Time Switch

is said to be completely reliable for time control use

Instrument Dept., General Electric Co., Schenectady 5, N. Y.—General purpose time switch suitable for indoor or outdoor use will turn electric circuits on or off at any time of day. Switch is furnished with either a plain dial for fixed time setting or an astronomic dial for dawn and dusk schedules. It may be set to any time of day with the minute-set dial and maintains a time schedule with the accuracy of an electric clock. One or more days may be

Here it is..... ...INTERNATIONAL'S

PRACTICAL PUSH-BUTTON OPERATION



The profitable
cope and drag molding combination
for you . . . for short runs or for high production—
all movements automatic—cycle controlled and completely
adjustable to meet all requirements. 750 to 10,000 lb. capacities.

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plan the best combination for
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Identical brass ingots now . . . or a year from now

Your order for specification brass today and your order for the same brass a year from now will be identical. Every heat of brass that Federated pours is carefully and repeatedly analyzed. Quality control at Federated is not just an occasional check, but is a regular step in every phase of our production program.

If your castings are hard to pour, or if they are designed for difficult, specialized service, this quality control is important to your customers. They must know that every order you fill will be identical so that they can buy from you with complete confidence.

Federated has a foundry service organization that can help you with any casting problems. Experts who know the cause of casting failures are available to visit your foundry and make corrective suggestions. And backing up these experienced servicemen is a complete, modern, non-ferrous metals laboratory that can trace the cause of trouble right back to its source.

Take advantage of these Federated extras. So many foundries do that we are known as Headquarters for Non-Ferrous Foundry Metals and for technical information on foundry problems. We have 13 plants and 23 sales offices across the country. Any of them will be pleased to help you.

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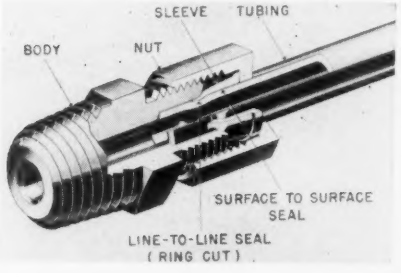
skipped during a week of operation with the use of an omitting device. Unit operates on 120, 240 and 480-v ac on frequencies of 25, 50 or 60 cycles.

For More Details Circle No. 519—Page 229

Tube Fitting

is self-aligning and can be installed without disassembly

Weatherhead Co., Fort Wayne Division, Fort Wayne, Ind.—Self-aligning tube fitting can be installed without disassembling by inserting the tube in the fitting until it bottoms, then tightening the fitting nut. Dual sealing principle assures positive, leak-



proof connections. Fitting is suited for instrumentation and other low and medium-pressure applications using copper and aluminum tubing. Sizes ⅛, 3/16, ¼, 5/16, ⅜ and ½-in. in brass are available from stock. Aluminum fittings are special to order. Line includes union, union tee, union elbow, male and female connectors, male and female elbows, male tees for pipe on run and pipe on branch.

For More Details Circle No. 520—Page 229

Pulley Lagging

solves problems of belt slippage on belt conveyors

Hewitt - Robins Inc., Stamford, Conn.—Pulley lagging has a grooved antislip surface similar to tread on automobile snow tires. Lagging is designed to prevent pulley slippage on belt conveyors operating on steep slopes or under wet service conditions. Diamond-shaped rubber grippers press against the underside of the conveyor belt and minimize slippage when power is applied through the pulley.

For More Details Circle No. 521—Page 229

Black Coating

is impervious to moisture and resistant to chemical attack

Maintenance Inc., Wooster, O.—All-purpose black coating protects metal, wood or concrete against practically any exposure condition. Paint is said to form a bright black finish

Introducing the NEW CAST-MASTER

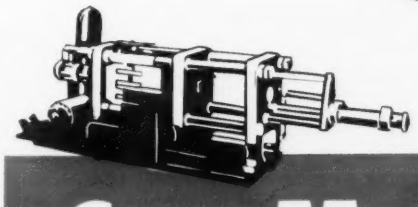
MAGNESIUM

HOT CHAMBER
Die Casting Machine

Now, for the First Time, a High Speed Process that makes it Possible to Produce Magnesium Castings at a New Low Cost!

The new Cast-Master Model-M for die casting magnesium, brings to the industry a safer, faster, more economical method for producing magnesium castings than ever before. The machine embodies the same fine features of other Cast-Master die casting machines. The "Dow type" hot end for die casting magnesium is used for metal injection. This end is similar to a zinc hot chamber arrangement thereby eliminating the disadvantage of hand ladling and making high speed production possible.

Illustration shows Magnesium Hot End Attachment on a Cast-Master Model 20 Die Casting Machine.



Eastern Rep. MILTON HARMON, 18 Rock Rd., Milford, Connecticut

CAST-MASTER *Inc.* **23901 AURORA ROAD**
BEDFORD, OHIO

that is impervious to moisture and resistant to chemical attack by gas fumes and smoke. Material reportedly does not crack, check, chip, flake or peel. It is adaptable to either brush or spray application. Delivery is in 5 gal pails or in 30 and 55 gal drums.

For More Details Circle No. 522—Page 229

Hole Saws

are for fast boring through most any kind of material

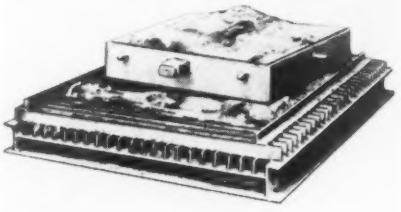
Miller Falls Co., Greenfield, Mass.—Follow-through type, deep-cut hole saws in sizes from 1 1/16 to 2 9/16 in. in diam have high-speed steel cutting edges welded to a chrome-vanadium body. Depth of cut is 2½ in. As the saw follows through its own hole, deeper cuts can be made by removing the core. Good chip removal is assured by spiral elevator grooves in the body of the saw.

For More Details Circle No. 523—Page 229

Shakeout Grids

can be custom-built for any application up to 10 ft sq

Syntron Co., 540 Lexington Ave., Homer City, Pa.—Vibrating shakeout grids are made of a rigid steel frame mounted on vibration dampers. Vibrator is fastened beneath the grid, protected from sand by metal shields. Assembly usually is mounted over a pit. Standard size is 36 x 36 in. but grids can be custom-built for any application up to 10



ft square. For automatic flow systems, grids usually are built flush with the system and designed to suit the width and length of individual flasks. Operation is from 220 or 440-v, 3-phase, 60-cycle current only.

For More Details Circle No. 524—Page 229

Thermocouple Head

provides a connection between small and large gage wires

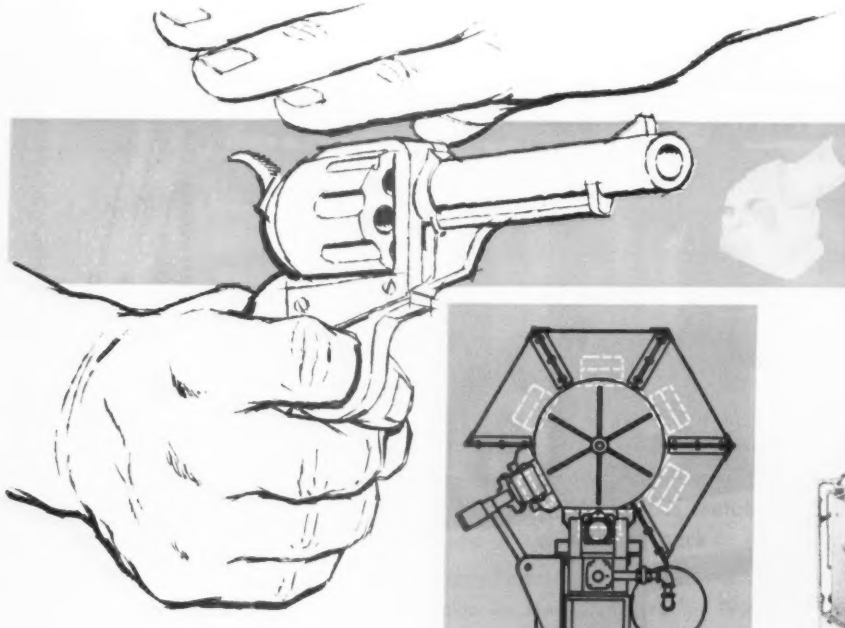
Marlin Mfg. Corp., 12410 Triskett Rd., Cleveland 11, O.—Miniature, screw type connection head is for thermocouples, electric heating elements or swaged, magnesium oxide insulated conductors. Stem sizes adaptable to the connector head are 1/16, ⅛, 3/16 and ¼-in. These sizes reportedly will provide a screw type connection between the small gaged thermocouple wires and the larger gage lead wires. All sizes are made in two models, plain and with angle bracket. Operating temperatures range up to 500°F.

For More Details Circle No. 525—Page 229

Multipurpose Valve

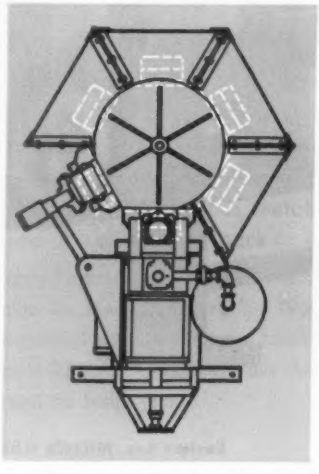
of spool type offers advanced valving concepts

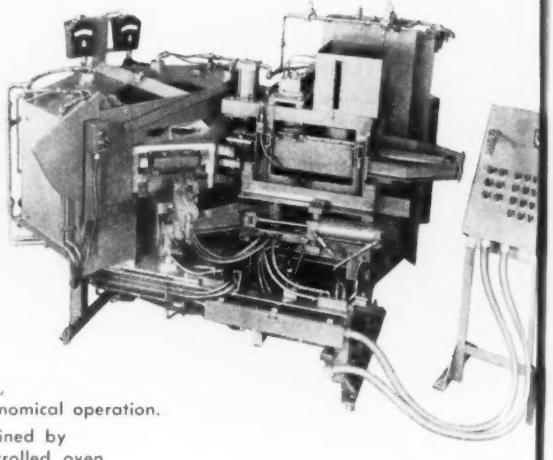
Ross Operating Valve Co., 107 East Golden Gate Ave., Detroit 3, Mich.—Compact, lightweight, fast-operating aluminum valve is for use in a wide range of air and oil pressure applications. Valve completes a cycle within 0.033 seconds, has working surfaces almost as hard as a diamond and is engineered to tolerances of 0.0001 in. It is available with ¼ or ⅜-in. pipe tap for inline, manifold or base mount; in single solenoid spring return, double solenoid momentary and double solenoid three position. These solenoid direct



Now...

Rapid-fire





Resembling the chamber of a six-shooter, the new SPO rotary assures fast and economical operation.

Accurate curing temperatures are maintained by automatic two-stage thermostatically-controlled oven and insulated oven sealing doors.

operated four-way spool type valve arrangements can be used for straight-way or three-way functions by plugging ports.

For More Details Circle No. 526—Page 229

Flooring Brick

withstands heat and thermal shock and has a long life

Walter Maguire Co., 60-A East 42nd St., New York, N. Y.—Brick for foundry and industrial plant floors is said to withstand the effects of heat and thermal shock. Bricks measure 2.22 x 3.55 x 7.75 in. and can be placed on end, on edge or flat to provide a floor of required thickness for specific conditions. Brick are generally laid over a base of sand and portland cement. After grouting, a curing for 24 to 36 hours is required before floor is ready for traffic.

For More Details Circle No. 527—Page 229

Hot-Material Belt

will not burn through under temperatures as high as 1400°F

Industrial Products Division, B. F. Goodrich Co., Akron, O.—Tests have indicated that scorching hunks of metal, heated as high as 1400°F, will not burn holes through a glass fabric insulated conveyor belt. Belt has two plies of glass fabric that "float" in the top rubber cover. Fabric retains its strength despite intense heat and bars progress of fiery metal

objects through the belt. When a piece of hot metal drops on the belt, the belt's rubber cover chars at that spot but only as far down as the glass fabric heat barrier.

For More Details Circle No. 528—Page 229

Safety Hat

of ribbed alloy construction will withstand severe impact

Davis Emergency Equipment Co., 47 Halleck St., Newark, N. J.—Lightweight aluminum safety hat of ribbed alloy construction is said to resist impact in excess of 40 ft-lb and will not crack or break when dropped. Six-point, snap-in shock absorber suspension distributes and minimizes shock. Hat is waterproof. Equipped with a universal, adjustable cradle, one hat fits all head sizes and shapes.

For More Details Circle No. 529—Page 229

Graphite Lubricant

for metallic and nonmetallic surfaces is applied by spray

American Resin Corp., 3215 North Sheffield Ave., Chicago 13, Ill.—Instant-drying, long-lasting graphite lubricant that can be applied to metallic and nonmetallic surfaces is supplied in 6-oz spray containers. Material is said to provide effective lubrication at temperatures from 100° below zero to 800°F. Material also is distributed in bulk.

For More Details Circle No. 530—Page 229

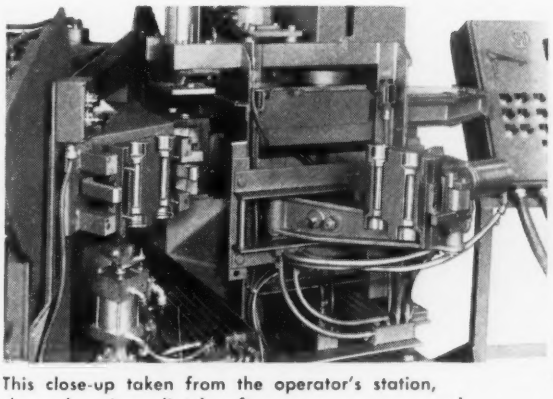
Motorized Reflex Machine

automatically indicates diameter of brinell impressions

Gries Industries Inc., Testing Machines Division, New Rochelle, N. Y. —Motorized machine automatically

PRODUCTION OF HOLLOW CORES

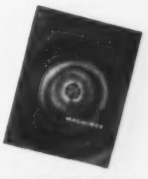
WITH THE NEW SPO ROTARY holo-core



This close-up taken from the operator's station, shows box immediately after cores were removed. While this operation is being performed, the blow head is filling the box just emptied. Four boxes containing blown cores are in curing oven.

Developed especially to meet the needs of mass-production foundries, this new model SC-10-R rotary holo-core machine accommodates six core boxes up to 10" x 12" x 6". COMPLETE CYCLE TIME IS 15 SECONDS OR LESS . . . and all operations, except removal of finished cores from boxes, are automatic and controlled by precision valves and electrical sequence timers.

Cores produced are extremely clean and accurate . . . distortion-free . . . easy to handle . . . ready to use.



WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES

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SPO INCORPORATED

6449 Grand Division Avenue
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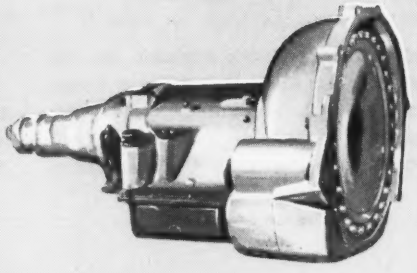
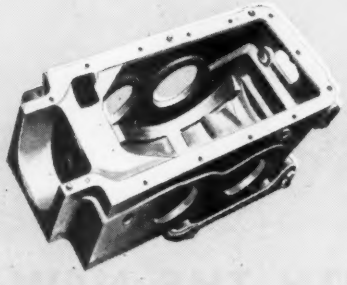
TOUSEY
CASTING SEALERS
for all applications...

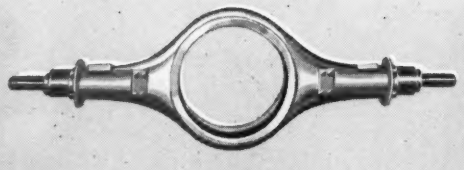
Leading manufacturers of Forgings and Castings have used Tousey sealers for almost 25 years.



Non-bleeding and non-toxic Tousey Casting Sealers apply easily and do not chip or flake away from machined surfaces. They seal slight imperfections and effectively cover minute leavings of blasting sand or dirt, as well as resisting alkali washing solutions. They resist many forms of abuse, including heat, rust, vibration and extreme temperature changes. On the outside of castings, Tousey Sealers afford an excellent prime coat for exterior painting.



If your problem is one where a Casting Sealer is concerned, write Tousey Varnish Co.—It is quite possible we have a formula that will fit your specifications—if not—our laboratories are set up to work out the answer.



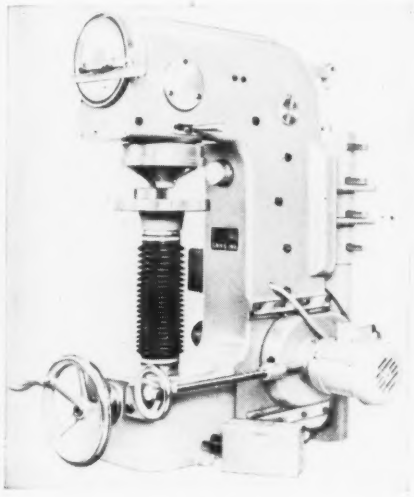
TOUSEY VARNISH COMPANY

520 West 25th Street, Chicago 16, Illinois

TOUSEY PRODUCTS

DURACOTE for DURABILITY

indicates the diameter of brinell impressions in accordance with standard brinell methods. Operator uses the machine like a "go-no go" gage. Loads are applied by dead weight, through a motor drive, with cycles adjusted from 5 to 60 seconds. A built-in optical system projects a



magnified image of the indentation on a ground glass screen. Various test loads are available from 120 to 3000 kg. Vertical clearance is 16 in., horizontal reach 8 in., net weight about 900 lb. Standard operation is on 220-v, 3-phase current.

For More Details Circle No. 531—Page 229

Walkie Electric Trucks

are available to transport and tier loads up to 6000 lb

Lewis - Shepard Products Inc., Watertown, Mass.—Walkie electric trucks are available as platform and pallet types for horizontal movement

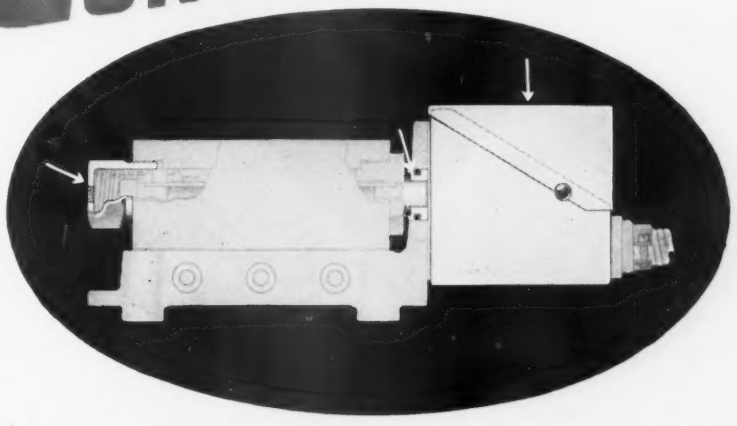
of pallets and skids in capacities to 6000 lb or as a stacking unit in straddle, open face pallet, platform and counterbalanced models (both telescopic and nontelescopic) for tiering and transporting loads from 1000 to 6000 lb. All controls are in one location and can be operated with the handle in any position including vertical. Operator obtains traction

SELECT

Quick-As-Wink®

AIR AND HYDRAULIC

CONTROL VALVES



New Dust-Tight Construction

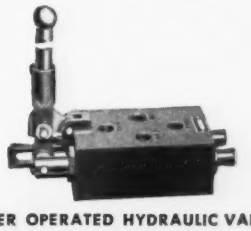
for SOLENOID VALVES

protects all operating parts from Dust and Grit

• Now you can get even greater value in Quick-As-Wink Solenoid Valves — *at no increase in price.* They've been dust proofed. A sintered bronze filter in the breather hole permits air to pass through in either direction, but prevents the entrance of dirt. A sleeve with two "O" rings assures dust-free operation where the solenoid armature contacts the valve plunger. The overlapping cover for the solenoid fits tightly but can be removed easily. It protects the solenoid even from the dust and grit blown around during "cleaning up" operations; provides ample space in which to connect the control wiring to the solenoid leads; and permits the splice to be tucked away inside the cover, not pulled back into the piping. Write for full details — *today!*

Ask us also about . . .

DIAPHRAGM OPERATED "O-TYPE" VALVE, can be actuated with instrument air as low as 12 to 15 psi.

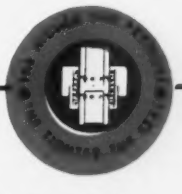


LEVER OPERATED HYDRAULIC VALVE suited for water or hydraulic oils up to 5000 psi. 2-way, 3-way and 4-way actions.

Quick-As-Wink®

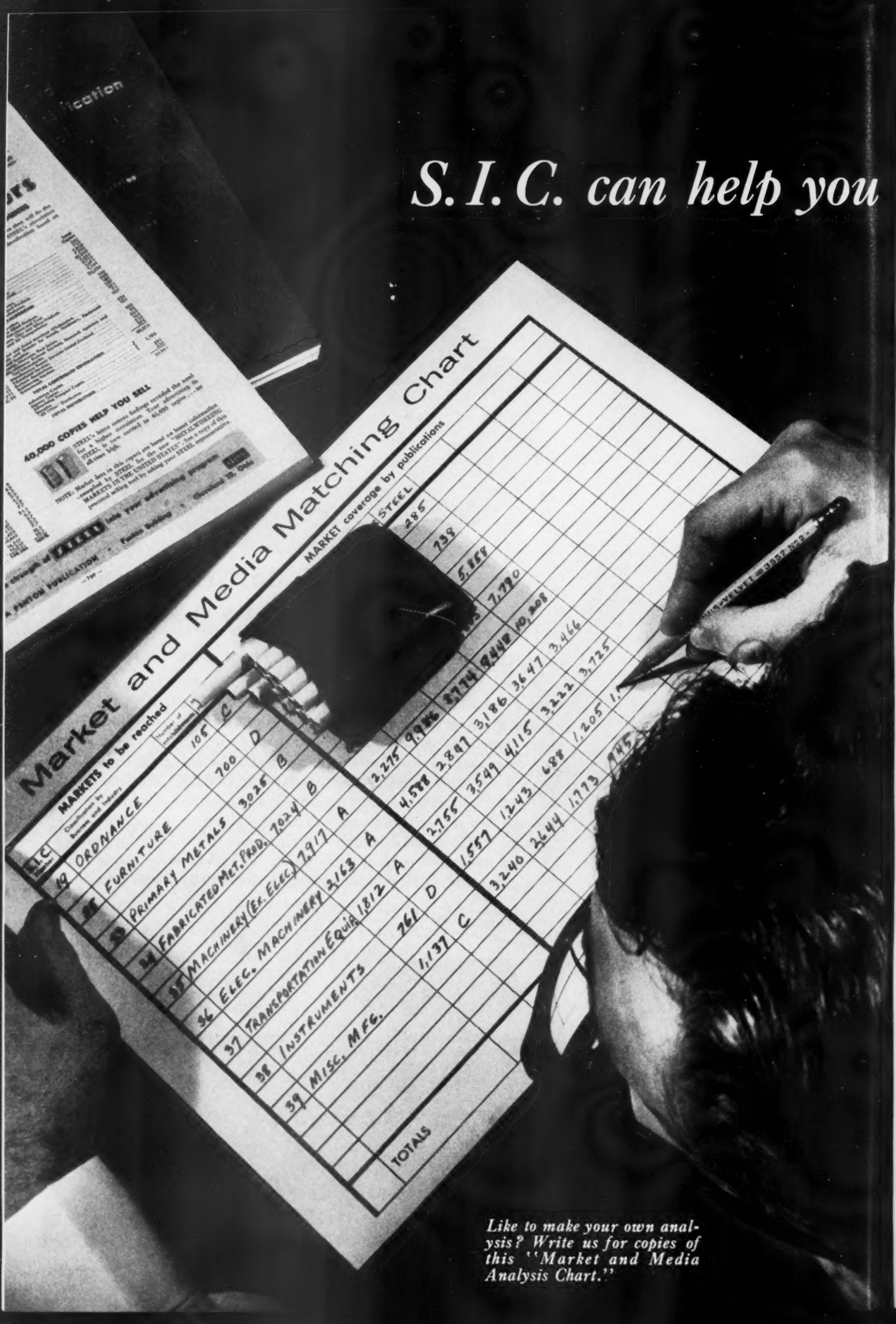
AIR AND HYDRAULIC

Control Valves



Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1976 East Pershing St., Salem, Ohio



Like to make your own analysis? Write us for copies of this "Market and Media Analysis Chart."

ou to match media to markets

How often, in buying business paper space, have you wished for some method of matching circulation to your market?

. . . Or a simplified, fast way of finding out what proportion of the worthwhile establishments and buying power you were reaching with a publication?

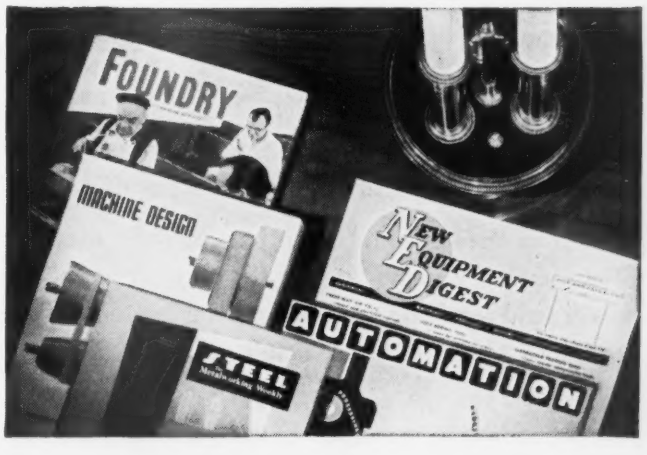
One advertiser calls it, "Taking the hocus-pocus out of circulation".

You can do it with S.I.C.—combined with the Penton Census. Reporting on the Standard Industrial Classification basis is distinctly a PENTON development—and a vital part of the Census Operation.

Take STEEL Magazine, for instance. When you look at the circulation analysis, you'll see how we've already matched circulation to the market for you. To help you quickly find out how we stack up, you can run your eye down the plant counts, and compare the coverage figures for every product category. You can readily see what proportion of the worthwhile establishments you're reaching.

You'll find similar information available on each Penton publication, to aid you in Media Selection.

This method of matching media to the market is made possible through the use of S.I.C. and the Penton Census. It's just one of the advantages of doing business with Penton.



the PENTON
Publishing Company

PENTON BUILDING • CLEVELAND 13, OHIO

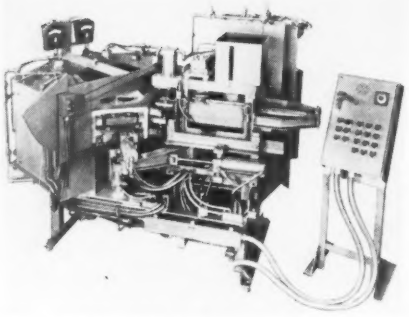
speeds, normal braking, dynamic braking and coasting position by rotating a cam controller with his thumb.

For More Details Circle No. 532—Page 229

Hollow Core Machine

produces ready-to-use cores in 15-second cycle or less

SPO Inc., 6448 Grand Division Ave., Cleveland 25, O.—Multistation, rotary type machine designed to mass produce precision hollow cores, accommodates six coreboxes up to 6 x



10 x 12 in. and has a complete cycle of 15 seconds or less. All operations, except for actual removal of finished cores, are automatically controlled by precision valves and electrical equipment. An automatic thermostatically-controlled oven and insulated oven-sealing doors assure constant and accurate curing temperatures.

For More Details Circle No. 533—Page 229

Drum Sander

has a simple-locking rubber cushioned abrasive drum

American Diamond Saw Sales, 120 N. W. Ninth Ave., Portland 9, Oreg.—Rubber-cushioned, split drum sander measures 12 in. in diam x 1 in. wide and permits use of ordinary strips of abrasive in place of endless belts or clipped end strips. Once

the abrasive strips are in place the sander halves lock into a balanced abrasive wheel by a locking cone.

For More Details Circle No. 534—Page 229

Diecasting Goosenecks

are custom-made for hot or cold chamber machine use

Dodge Steel Co., Finished Products Division, 6501 Tacony St., Philadelphia 35, Pa.—Special alloy steel goosenecks for diecasting machine applications are custom made to specifications, to any size and for any diecasting machine. They are delivered either rough, machined or machined with sleeves. Other diecasting machine parts as pots, nozzles, spouts and plungers also can be manufactured.

For More Details Circle No. 535—Page 229

Air Control Assembly

automatically filters and regulates compressed air

Airmatic Valve Inc., 7317 Associate Ave., Cleveland 9, O.—Air control assembly automatically filters, regulates and lubricates compressed air used in operation of pneumatic equip-

CAN YOU AFFORD to make sand strainer cores in your plant?

We Invite You To MAKE THIS TEST

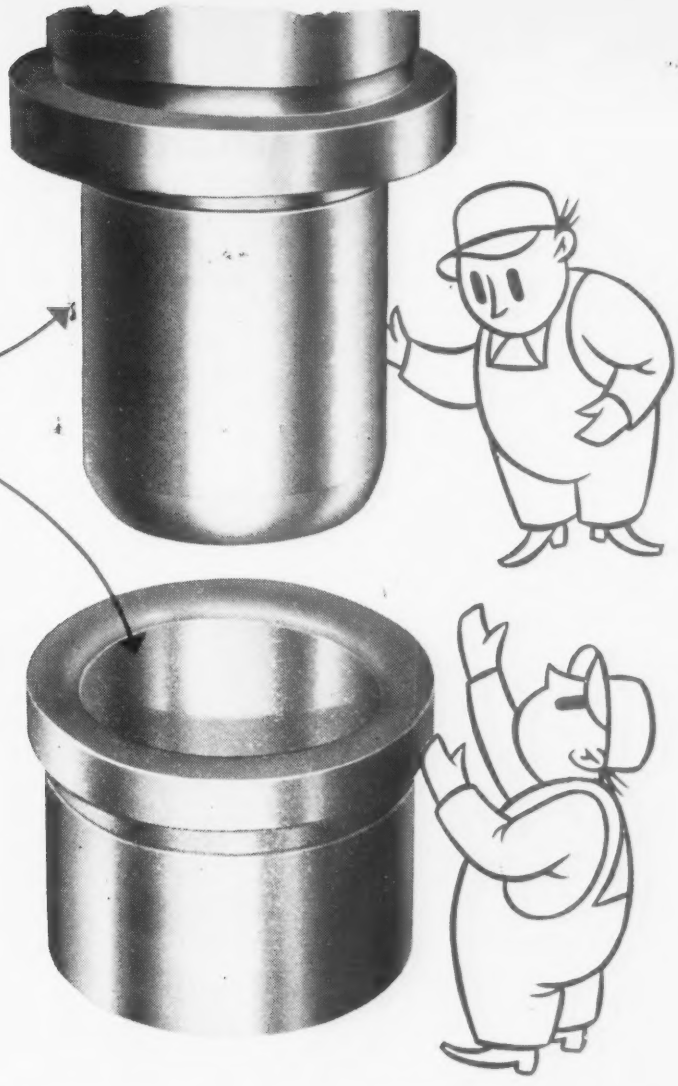
• Can ceramic strainer cores give you better castings at lower costs than sand strainer cores made in your own plant? Investigate! Make this test — free!

Just tell us the sizes and quantities of sand strainer cores you are now using, or send us samples of your sand cores. In turn we will send you samples from our large stock of standard size ceramic cores for this test. Don't miss this chance to compare. Write today.

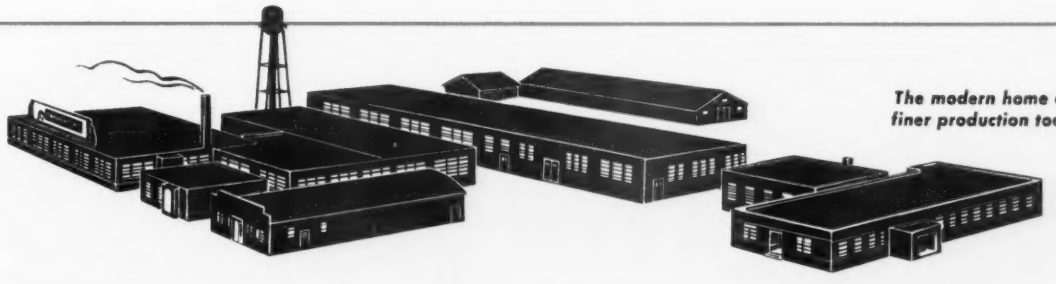
Porcelain Products' Ceramic Strainer Cores are available in a wide range of standard sizes—or, on special order, in sizes to meet your specifications.

62 years Porcelain Products, Inc. PP INC. FINDLAY, OHIO

carburized and hardened steel wearing surfaces and ductile cores mean long life for UNIVERSAL flask pins and bushings



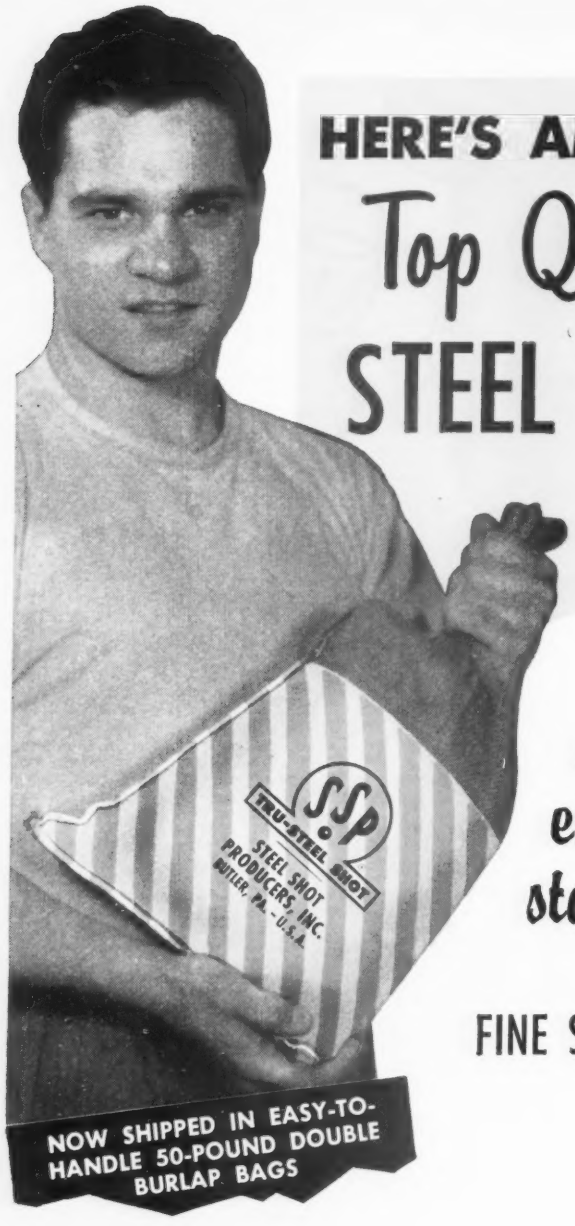
It's no easy trick to produce flask pins and bushings that are hard enough to take long, rigorous wear, and yet have cores ductile enough to resist breakage and rough treatment in the foundry. However, Universal has accomplished this difficult task. Universal flask bushings are double quenched and double drawn to produce a fine grain structure that will withstand considerable stress and strain without breaking or chipping. The wearing surfaces are carburized and hardened to reduce wear and prolong the life of both pin and bushing. Universal flask pins and bushings are precision ground to extremely close tolerances to insure instant, accurate alignment of cope and drag. Plain, taper and threaded series pins and bushings are available in a complete range of sizes as regular stock items. For complete information about Universal flask pins and bushings, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or the home office.



The modern home of finer production tools

172

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN



HERE'S AMERICA'S

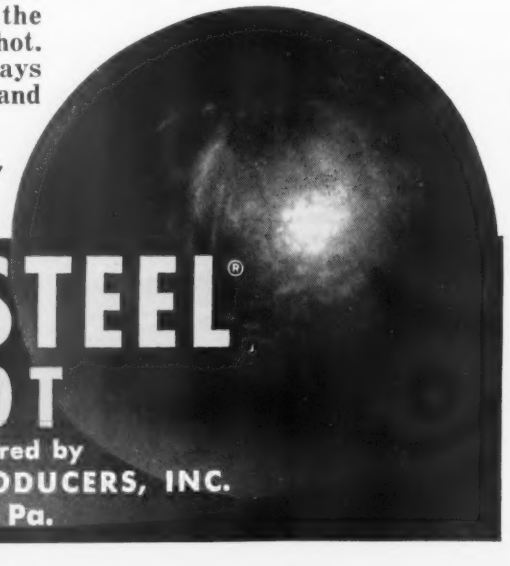
Top Quality STEEL SHOT

MADE TO *exacting standards* of FINE STEEL MAKING

NOW SHIPPED IN EASY-TO-HANDLE 50-POUND DOUBLE BURLAP BAGS

Round, solid, tough—Tru-Steel has everything you expect in steel shot—obtainable only through precision control of manufacturing processes, unsurpassed plant facilities and the know-how of specialists whose only business is the manufacture of steel shot. Tru-Steel sells and stays sold on the basis of test and comparison. Write us.

Sold and recommended by Pangborn Corp. Hagerstown, Md.



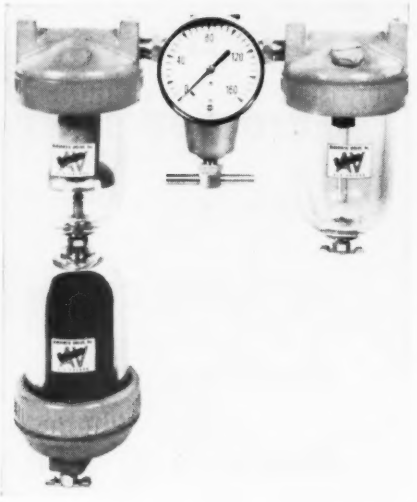
TRU-STEEL® SHOT

Manufactured by

STEEL SHOT PRODUCERS, INC.

Butler, Pa.

ment. Sludge, formed of dirt, scale, rust and moisture is automatically trapped by the filter. An automatic drain trap at bottom of filter collects moisture from the filter, eliminating periodic draining maintenance. After



cleaned air is regulated to a desired pressure, a fine oil mist is added by the lubricator. Lubricated air is carried to the operating parts of the equipment.

For More Details Circle No. 536—Page 229

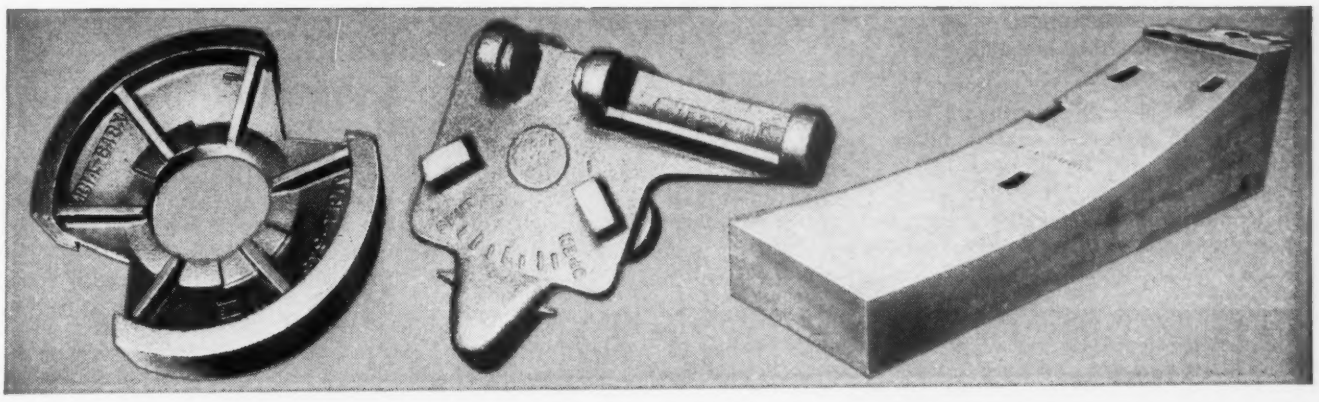
Lift Truck

uses a single mast that provides rigidity and stability

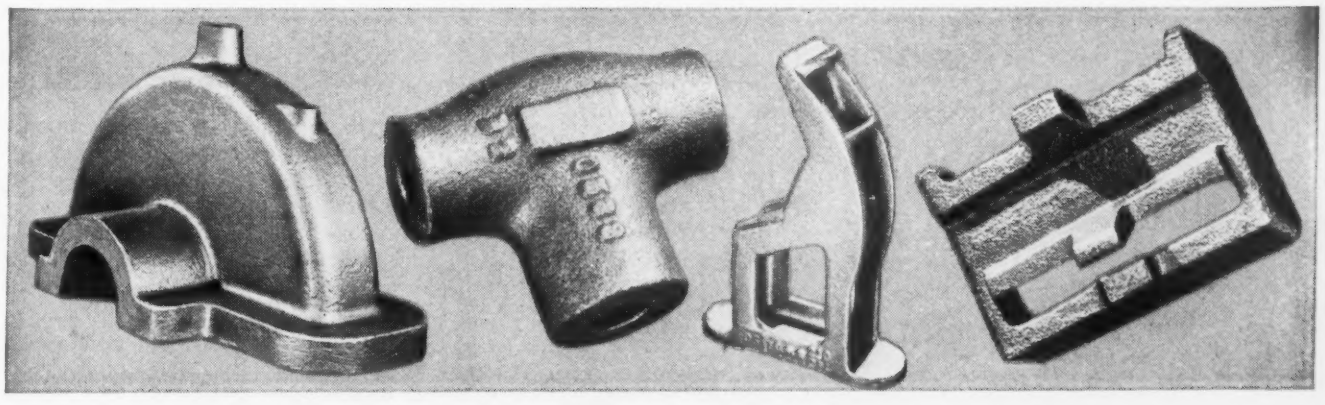
Hyster Co., 2902 North East Clackamas St., Portland 8, Oreg.—Gas-powered, single-mast, pneumatic-tired

lift truck has 2000 lb capacity at 24-in. load centers. Company's line of hydraulic attachments can be mounted on the attachment carriage. LP gas conversion kits also are available. Upright mast assembly can be field installed on some of the company's models. Advantages claimed for the unit are improved operator visibility, fast load placement and

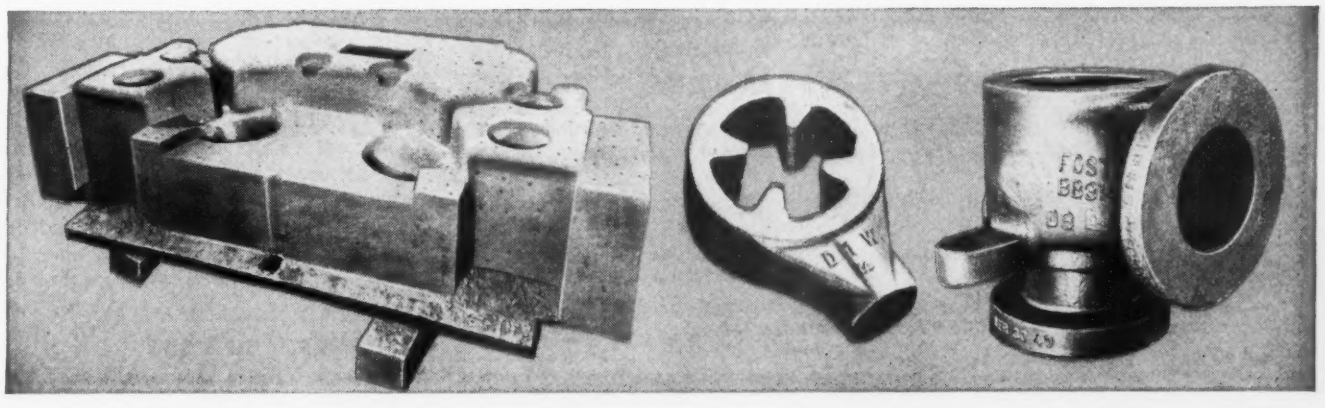
LARGE OR SMALL, IRON OR STEEL,



WHEREVER METALS ARE CAST,



YOU CAN USE TRULINE® BINDER



Naval Stores Department **HERCULES POWDER COMPANY** INCORPORATED *920 King Street, Wilmington 99, Del.*

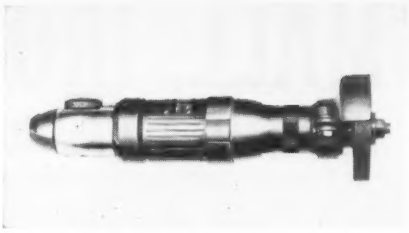
NF55-2

reduced driver fatigue. Rigidity and stability of the truck are said to be excellent.

For More Details Circle No. 537—Page 229

Rotary Grinders

are for precision work as well as production grinding



Thor Power Tool Co., Aurora, Ill. —Air-operated rotary grinders are available in models based on motor speeds of 7, 10, 12, 15 and 18,000 rpm. Intended for precision work and production grinding the grinders weigh less than 3¾ lb, have an over-all length of 11¼ in. and operate at their respective speeds on air pressure of 90 lb. They are equipped with ¼-in. air inlet pipe threads and take a minimum hose size of ⅜-in.

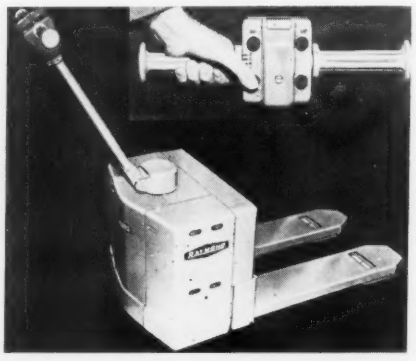
For control they contain a thumb-twist throttle. The 7000-rpm model takes a 3-in. vitrified wheel and the 18,000-rpm model uses a 1½-in. vitrified wheel. Wheels for intermediate models range between these sizes.

For More Details Circle No. 538—Page 229

Walkie Electric Truck

measures 20½ in. longer than its load length

Raymond Corp., 65-139 Madison St., Greene, N. Y.—Walkie electric truck has an over-all length 20½ in. greater than the load length. Power pack of four automotive type bat-



teries provides 24-v operation with no resistance loss in second and third speeds. Manufacturer says the energy in the four automotive batteries will equal that of a single industrial battery. Batteries can all be charged at one time without removal from the chassis. Initial model is designed for pallet handling and is offered in 4000-lb capacity.

For More Details Circle No. 539—Page 229

Propeller Fans

move air in applications that require a low noise level

Propellair Division, Robbins & Myers Inc., Springfield, O.—Direct-connected axial flow fans are designed for air-moving applications requiring low noise level operation. Six sizes are available from 12 through 36 in. with air delivery ratings to 12,000 cfm. Fans are powered by totally-enclosed, continuous-duty, 115/230 v, permanent split capacitor motors. Fans are adaptable to two-speed operation as well as variable speed.

For More Details Circle No. 540—Page 229

Intercom Telephone

uses batteries and provides clear reception up to 1000 ft

Tube-Strut Division, Tubular Structures Corp. of America, 3129 Riverside Dr., Los Angeles 27, Calif.—Private line intercom telephone uses

Now in operation, this new production foundry is operating continuously over two 8 hour shifts, employs 2,000 workers and is pouring 1000 tons of gray iron every 16 hours. Cores and molds are baked and dried in Despatch Ovens.

DESPATCH OVEN FEATURES

Increased Production—100% convection heat and up to 75% recirculated air give speedy warm up, fast heat recovery after reloading and fast baking.

Quality Baking—Heavy duty, high volume fans give speedy heat transfer, assure uniform baking.

Approved Control—Despatch ovens are equipped with automatic temperature controls and fire underwriter approved safety systems.

Efficient Operation—Direct gas or oil fired heaters cut fuel costs . . . for more information about Despatch Foundry Ovens . . .

Write for Bulletin 31, or request a representative call.

Minneapolis Office: 619 S.E. 8th St. Chicago Office: 4554 N. Broadway
Sales and Service in all Principal Cities

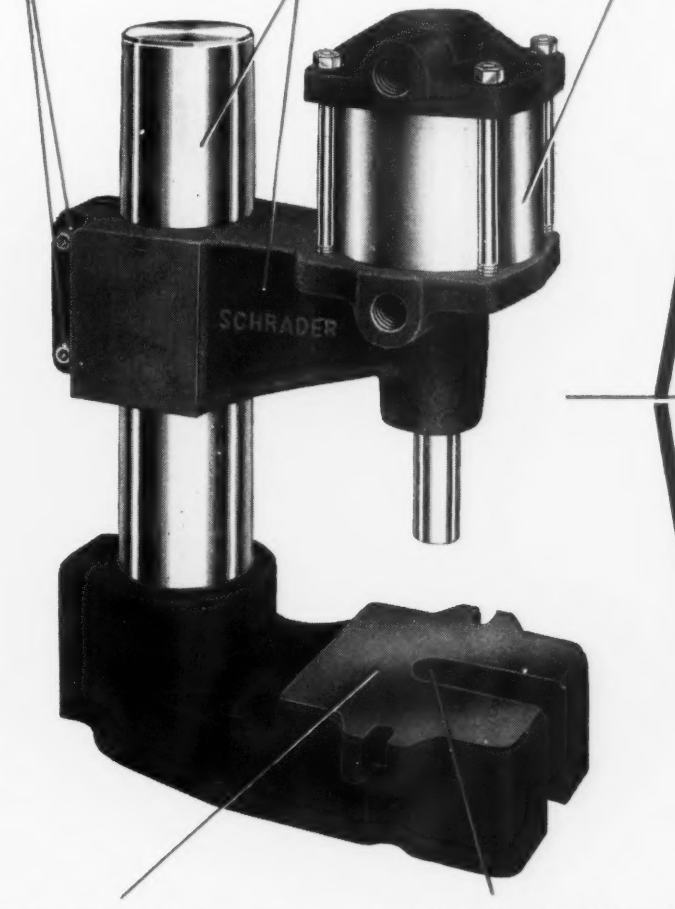
DESPATCH OVEN COMPANY

PIONEERS IN ENGINEERING HEAT APPLICATIONS FOR INDUSTRY

TWO-BOLT CLAMPING adjusts easily, positively from 0" to 7" in height, and swing arc 2" each side of center.

HEAVY-DUTY CYLINDER with extra heavy wall, tie rods and piston construction for longer life.

RIGID STEEL COLUMN and rugged cylinder bracket are accurately machined for precision work.



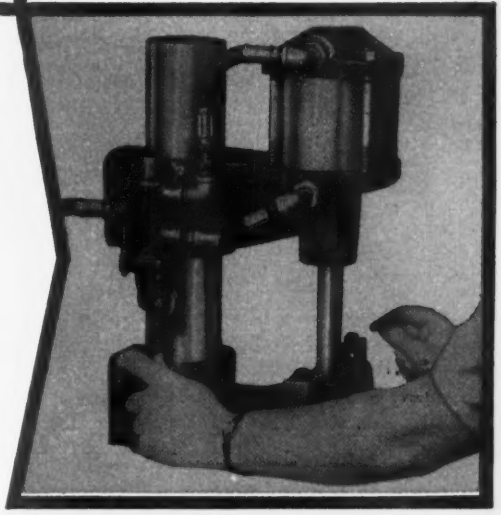
HEAVY, RUGGED BASE forms sturdy foundation for large machined-surface table area.

SPECIAL RECESS IN TABLE provides for punch-through operations.

NEW SCHRADER AIR PRESS

It's compact and power packed!

It stamps, coins, broaches, rivets, stakes, presses, shapes, bends, assembles—*many other uses!*



Modern "muscles" of compressed air never tire . . . get more work done at less cost!

This modern Air Press has unlimited possibilities for speed, power, positive performance. Available as single acting for impact jobs; double acting for squeeze and power withdrawals. It requires minimum space, next to no maintenance, is extremely versatile in adapting to operating controls. Can't be beat for low cost practicality.

Important feature: Control and speed of the extra heavy cylinder and ram can be varied as necessary, by using standard Schrader Air Control Accessories that adjust in seconds.

Write for Catalog data describing Air Press fully—including variety of controls, accessories and prices. You'll be surprised at the low prices!

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
470 Vanderbilt Avenue, Brooklyn 38, N. Y.

Schrader®
ESTABLISHED IN 1844

LEADERS IN AIR CONTROL SINCE 1844

SP-8020

CORE BINDER RESIN

SP-8020 Core Binder Resin is the most versatile and economical binder known. It may be mixed with a wide variety of sands in conventional mulling equipment to meet almost any green or baked core requirement. The exceptionally high miscibility of this resin assures perfect distribution resulting in stronger, harder, and more uniform cores. Other advantages are faster baking, higher resistance to metal penetration, better permeability, and lower gas evolution. Use SP-8020 with confidence for ferrous and non-ferrous castings. Get complete information. Write for the Core Binder Bulletin today.

SCHENECTADY RESINS

Div. of Schenectady Varnish Company, Inc., 200 Congress St., Schenectady 1, N. Y.
Schenectady Varnish Canada Ltd., 409 Comstock Road, Scarborough, Ontario, Canada

☐ Please have your representative call.

☐ Please send Core Binder Bulletin.

Name _____

Company _____

Street _____

City _____ Zone _____ State _____

flashlight batteries for power and reportedly gives a clear signal up to 1000 ft. Equipment is said to be original Bell Telephone Co. equipment, with the same high fidelity as regular office phones. A master station for multiple hook-up also is available which lets any station talk with any other with complete privacy.

For More Details Circle No. 541—Page 229

Telephone Booth

prevents noise from overriding telephone conversation

Detroit Macoid Corp., 12340 Cloverdale, Detroit 4, Mich.—Device reportedly prevents telephone con-

versations from being overwhelmed by the roar of industrial plants. Booth-like cabinet has a 44-in.-high opening for the head and shoulders of person talking on the phone. It attaches to the wall and weighs 26 lb. Manufacturer reports that tests have demonstrated that inside the booth the din of a plant is reduced to nearly the level of a murmur in an average business office.

For More Details Circle No. 542—Page 229

Temperature Control

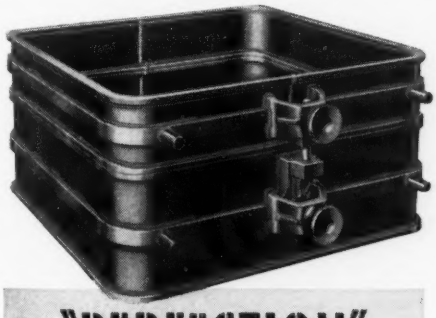
will maintain temperatures within ½ per cent limits

Jelrus Co., 136 West 52nd St., New York, N. Y.—Automatic and controlling pyrometer is for use with chromel-alumel, iron-constantin and platinum-10 per cent rhodium thermocouples. Controller operates on a photoelectric principle, eliminating moving parts and contact wear. Unit can be set for automatic continuous maintenance of a desired temperature or can be set as a limiting controller, shutting off the heating device when the desired temperature is reached. Portable units as well as

No Other Foundry Flask Gives You All 4 Features!

1. Continuous welding of bearing strips—inside and out.
2. Cast steel trunions.
3. Cast steel pinlugs and clamplugs.
4. Elimination of corner stresses.

Elliott Company Replaces With "PERFECTION" Foundry Flasks!



"PERFECTION" Flasks—

Designed By Foundrymen For Foundrymen!

Because of the rugged endurability of BS&B "PERFECTION" Foundry Flasks in the toughest kind of day-in and day-out foundry service, Elliott Company of Jeannette, Pa., has standardized on "PERFECTION" Flasks for all replacement purposes.

Elliott produces electric motors in one of the industry's most completely equipped and up-to-date grey iron foundries.

Here, BS&B "PERFECTION" Flasks in all sizes are giving long, economical and trouble-free service under the tremendous vibrations, jars, stresses and strains encountered daily on gravity rolls, roll-outs, conveyor lines and automatic shakeouts.

If you'd like more information on how "PERFECTION" Foundry Flasks can help you get better castings at lower cost, we'll gladly send it without obligation. Address your inquiry to . . .

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.
Foundry Flask Division—Dept. 7-AR6
7500 East 12th Street Kansas City 26, Missouri

For more information, use Reader Service Card, page 229

GOT MELTING PROBLEMS?

Solutions to foundry problems often come easier to outside consultants. Get expert help; call for a Semet-Solvay metallurgist . . . he's a practical foundryman whose job it is to help you.

SEMET-SOLVAY DIVISION
ALLIED CHEMICAL & DYE CORPORATION
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For Better Melting

NOMAD
CONVEYOR SYSTEMS

...TAILORED TO FIT YOUR NEEDS

There is a "just-right" piece of Nomad equipment to do the job whether for basic foundry needs or for fully powered mold handling line consisting of mold dump, pallet raiser or elevator. In each case your foundry layout will be space-saving and compact with increased efficiency and high profit-making production.

Nomad Foundry Equipment is adaptable for use by big mechanized foundries or for the smaller foundry who wants to modernize.

Write for more information on "cutting the pattern" to suit your *own* problems.

Mold handling mechanism and pallets pat.

NOMAD FOUNDRY EQUIPMENT

WESTOVER CORPORATION
NOMAD EQUIPMENT DIVISION
3110 W. FOND DU LAC AVE. • MILWAUKEE 10, WIS.

panel mounted units can be supplied Loads up to 15 amps can be handled directly for either 110 or 220 v, ac current.

For More Details Circle No. 543—Page 229

Industrial Trucks

have been redesigned to improve their maneuverability

Automatic Transportation Co., 149 West 87th St., Chicago 20, Ill.—Complete line of operator-led, electric-

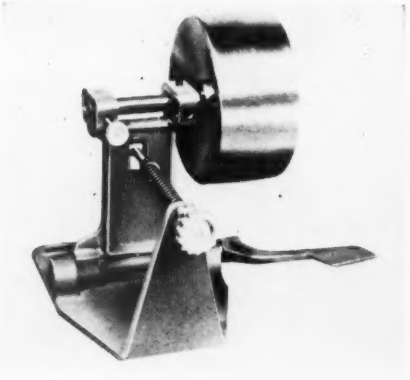
driven industrial trucks includes pallet models, high and low lift platform trucks, high lift suspended load type stackers and tractors. Units measure 21½ in. plus length of load. The line has been completely redesigned to incorporate innovations aimed at improved maneuverability and ease of maintenance.

For More Details Circle No. 544—Page 229

Backstand Idler

can be set up as idler for grinding or polishing units

Curtis Machine Corp., 1300 East Second St., Jamestown, N. Y.—Backstand idler for use with 4, 6 and 8-



in.-wide belts can be set up as the belt idler for any grinding or polishing lathe. Design features a foot pedal for belt tension release which leaves both hands free for changing the belt. Manufacturer says posi-

WANT TO MELT A MOUNTAIN OF METAL?

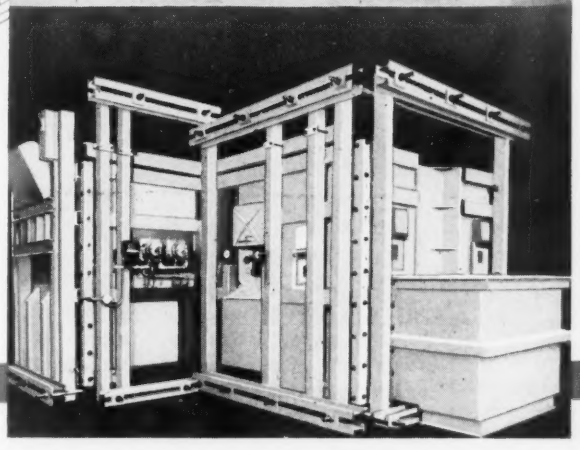
THESE BIG STROMANS WILL DO IT...BUT FAST!

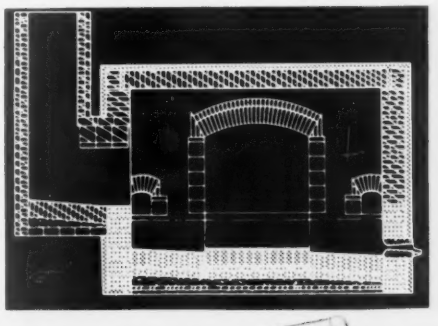
STROMAN LARGE SIZE REVERBERATORY FURNACES

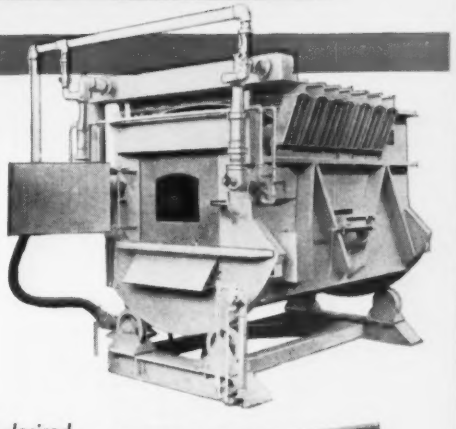
For Melting Unlimited Capacities of Aluminum, Zinc or Brass

These reverbs are built to assure heavy duty production for Smelting, Extrusion work, Die Casting, Permanent Molding and Foundry melting. Now in operation in some of the most prominent plants in the country, they have proved their ability to deliver large tonnages of metal, are easy to work with and around . . . operate most economically and are easy to maintain. Their efficiency and economy will amaze you and convince you of their superiority.

Furnaces of this type are designed to meet customers' individual requirements . . . let our engineers show you how to achieve utmost efficiency and economy in your melting operations.

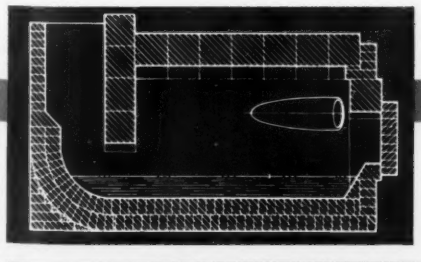




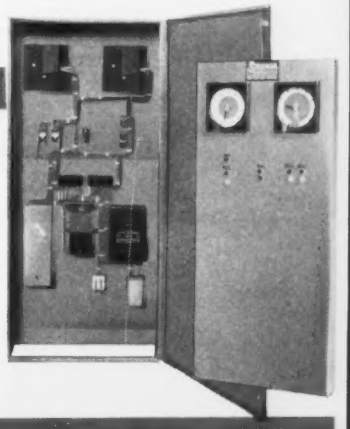


STROMAN TYPE "SW" CRADLE TILTING FURNACE FOR ALUMINUM MELTING SIZES FROM 1,000 TO 3,000 POUNDS

An ideal furnace for breakdown to supply hot metal to holding furnaces for die casting or permanent mold. Also for distribution to the molding floor in sand casting foundries. Tilted by means of an air or hydraulic ram. Furnished complete with gas or oil burners or combination burners, blower to furnish combustion air, and lining made of standard fire brick shapes.



Automatic temperature and safety controls available if desired.



STROMAN CUBICLE TYPE CONTROL PANEL

Stroman design monitor for furnace metal temperature, refractory temperature, high limit blower motor, circuit, electric ignition, and flame safety control, with completely automatic built-in warning system.

Don't forget STROMAN make furnaces for the melting of brass, bronze, aluminum, magnesium, grey iron and all other metals in sizes to meet your needs no matter how large or small.

Write for complete catalogue today!

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DIVISION OF THE PETERSEN OVEN CO. • FRANKLIN PARK, ILL.

tive belt control is assured with adjustable spring loaded belt tension and accurate tracking control. Unit can be installed on floor, pedestal or wall without adapters.

For More Details Circle No. 545—Page 229

Axial Flow Blower

is small but powerful and produces 60 cfm of free air

Motronics Corp., 241 Concord St., Glendale, Calif.—Axial flow blower has a body 2.2 in. in diam by 3 in. long and produces 60 cu ft of free air per min. Incorporation of a nose spinner in the impeller design increases effective blade area, which results in marked reduction in noise and considerable increase in air flow.

For More Details Circle No. 546—Page 229

Plastic Metal Compound

bonds permanently and tightly to practically all materials

Travaco Laboratories, 233 Condor St., East Boston 28, Mass.—Self-hardening plastic metal compound in both liquid or nonsagging putty form reportedly hardens like granite in minutes and produces a fine-grain surface which sands and machines like soft gray iron. Material is said to be unaffected by cold as low as −60° F or heat as high as 350° F. Manufacturer says the material bonds tightly and permanently to all metals, plastics, wood, ceramics and concrete.

For More Details Circle No. 547—Page 229

Motors and Generators

are rated from 1 to 150 hp and from ¾ to 100 kw

General Electric Co., Schenectady 5, N. Y.—Direct-current motors and generators built to NEMA standards are rated from 1 to 150 hp and from ¾ to 100 kw, respectively. Speed is adjustable by armature voltage control, field strength control, or any combination of both. Motors can operate at any speed below base, including stalled torque. Both motors and generators have dripproof enclosures and are supplied with a guaranteed 15 per cent service factor. Class B insulation is supplied throughout.

For More Details Circle No. 548—Page 229

Surface Plates

are made from black granite for long life and accuracy

DoAll Co., Des Plaines, Ill.—Black granite surface plates and accessories have been added to company's line of gage blocks and gaging instruments. Plate sizes range from small toolmaker's flats, 8 x 12 in., to one-piece layout tables, 72 x 144 in. Larger table areas are obtained by joining several granite tables with special stands. Straight edges, parallels, chuck platforms and angle plates are available for checking steel and granite plates or for making setups to check dies, tools and other parts.

For More Details Circle No. 549—Page 229

Door Hose

for open-hearth doors is made to resist searing heat

Goodyear Tire & Rubber Co., Akron, O.—Open-hearth door hose consists of a tube made with special rubber compound reinforced with steel wire braid insulated with asbestos. Outside is covered with an open braid of stainless steel wire that will not rust. Mesh cover protects the asbestos insulator and minimizes build-up of molten splatter. Made in 1, 1¼ and 1½ in. ID, hose can be supplied in 45 to 50-ft lengths. Specified lengths available on special order.

For More Details Circle No. 550—Page 229

It's New!
A dependable, LOW COST . . .
Motorized Brinell Hardness Tester by
Steel City Testing Machines, Inc.
● Positive accuracy
● Finger-tip operation
● ¾" stroke
● For shop or laboratory

Now even the smallest shop can afford a dependable and versatile Brinell Hardness Tester. Priced exceptionally low, Model L is a motorized hydraulic machine with which even an inexperienced operator can make tests in strict conformance to A.S.T.M. Standards.

Engineered by Steel City, leader in the field since 1914, the new tester is designed for years of maintenance-free operation. The ¾" stroke permits successive tests without anvil readjustment. Load is applied by finger-tip pressure on operating handle.

Write for full particulars today and name of nearest sales representative—conveniently located in your area.

MODEL L
Vert. opening—9"
Throat depth—6"
Bench space—9" x 25"

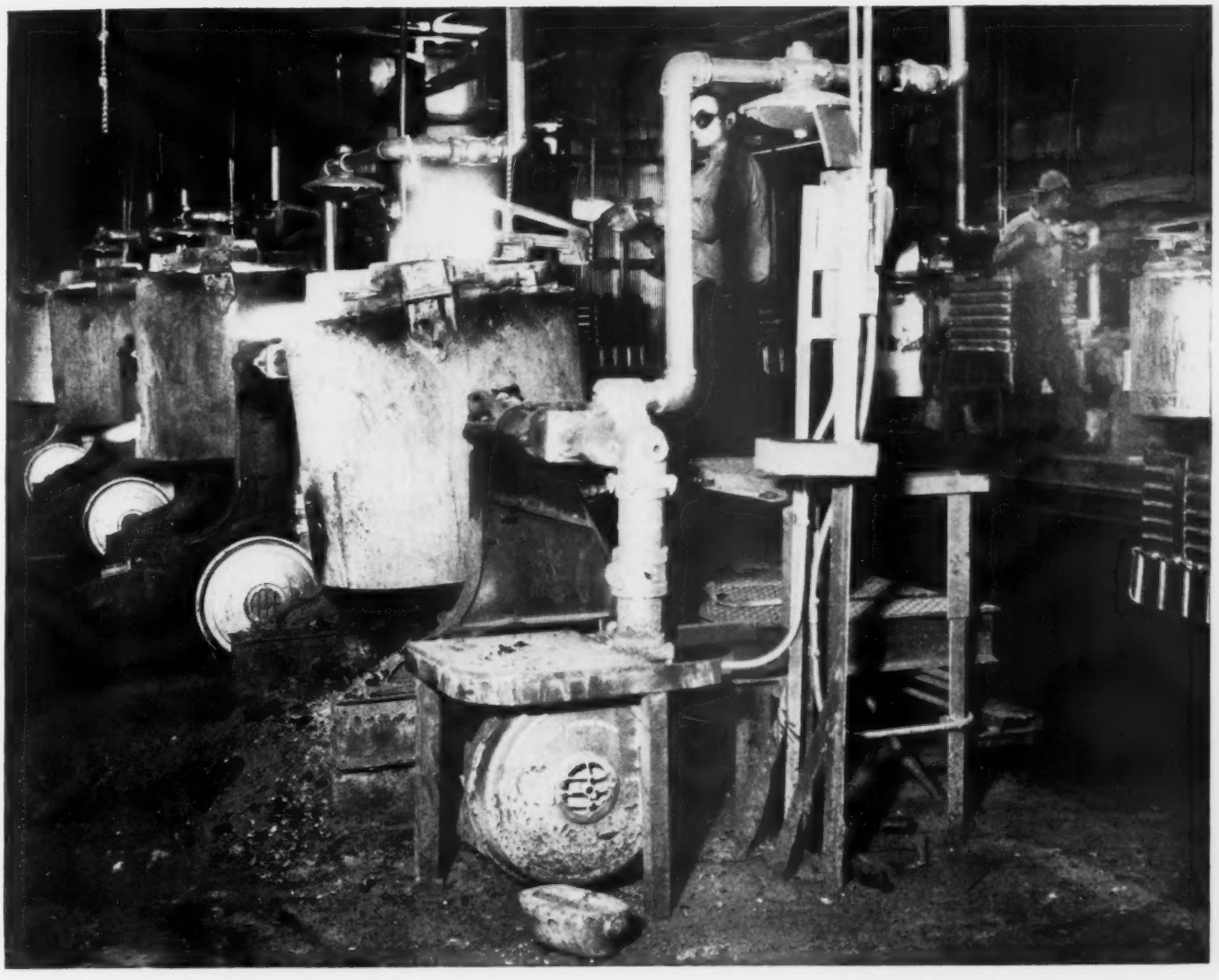
Manufacturers of machines for testing physical properties of metals, including:

Steel City Testing Machines Inc.

Brinell Hardness | Ductility | Tensile | Compression
Transverse | Hydrostatic | Proving Instruments | Flex-Tester

. . . and Special Testing Machines.

8801 Lyndon Ave. Detroit 38, Mich.



Schaible Company finds Blowers that can take it

The air in this typical production foundry is full of sand and dirt—but North American blowers, designed for heavy duty, give constant pressure year-in and year-out, even on these really tough jobs. Foundry success depends on steady operation—steady blower operation.

All 18 Campbell-Hausfeld tilting crucible furnaces in this brass foundry use:
North American No. 300 Turbo Blowers
North American No. 65 Aspirator Mixers
North American
No. 18 Atmospheric Regulators
North American No. 25 Butterfly Air Valves

For Better Blowers – Buy North American

NORTH AMERICAN COMBUSTION since 1917

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SPECIAL FOUNDRY COKE

"...as you want it!"

- Only premium grades of coking coals go into it—the best the market affords.
- Full care to highest possible fixed carbon and shatter resistance. Low ash. Proper density and uniform cell structure.
- Result? You choose wisely and permanently when you specify Terre Haute special foundry coke.

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Manufactured by: INDIANA GAS & CHEMICAL CORP.
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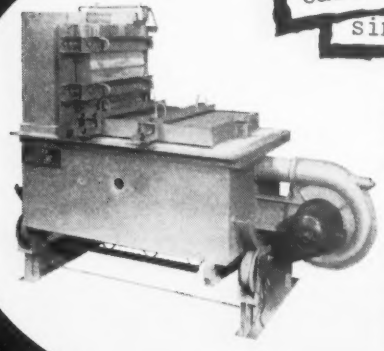
Here's what Industry has to say about REDA melting Furnaces . . .

nothing but praise for the REDA FURNACE . . .
has improved overall foundry operation . . .
doing a wonderful job . . .
much more flexible . . . entirely satisfactory .
castings come cleaner . . .
sincerely recommend it . .



Reda Stack-Loading melting furnaces for ferrous and nonferrous metals have been designed and built by experienced foundrymen for foundrymen everywhere. That is why Reda furnaces provide advantages far beyond those found in other, and more expensive types; that is why, with Reda furnaces there is less down time for maintenance, l o n g e r uninterrupted melting runs, and lower melting costs.

Another feature is the Reda Burner arrangement which can operate from oil and gas simultaneously or be switched from one fuel to the other instantly. *Write or phone for complete details.*

REDA FURNACE
REDA PUMP COMPANY • BARTLESVILLE, OKLA.

Materials for Future Autos Discussed at ASTM Meeting

Materials for the automobile of the future were discussed by Alfred L. Boegehold, head of the metallurgy department, Research Laboratories Division, General Motors Corp., at the Apr. 12 Cleveland District meeting of American Society for Testing Materials in Cleveland Hotel, Cleveland.

Economy, efficiency and reduced weight with no sacrifice of roominess are factors which will determine engine type and body style of future cars. Affecting those factors will be replacement of strategic materials with common ones, fuel conservation and mechanical and thermal efficiency of the engine, materials and fuels.

Turbine engines are lighter and smaller than piston engines. But acceleration must be improved and the heat problem solved. Liquid cooling might be used, but that would reduce the engine's weight advantage.

Free piston engines have good power-to-weight ratio and can use any fuel. Fuel consumption is low. The turbine section in this engine operates at 800-900°F. However, many turbine stages are required.

Piston engines in the near future will be designed for 12 or 13 to 1 compression ratio and gasoline will be available for that engine. High-octane gasoline will be needed but the fuel consumption will be lower. The improved economy will be comparable to today's diesel engines.

Automotive plants are tooled to produce piston engines. Consequently, the trend for the next 15 years will be to keep and improve them. Also, more aluminum and magnesium will be used in piston engines. Die cast aluminum engine blocks are a strong possibility. Other aluminum parts may be cylinder heads, intake manifolds and many automatic transmission parts. The oil pan and other covers may be magnesium. Valves may be of aluminized alloy steel. By 1980 the average automobile will be using 200 lb of aluminum.

Exhaust manifolds will remain gray iron; bearings will be about the same as today; the use of cast crankshafts will increase.

For turbines, nickel alloys will be used for buckets and aluminized steel for nozzle vanes.

Appoints New Distributor

Burr Aluminum Products Div. of Keyes-Davis Co., Burr Oak, Mich., has appointed M. A. Bell Co. of St. Louis and Houston, Tex., to sell its aluminum bottom boards and jackets in the Southwest.

Want BANG-UP Results Every Time?

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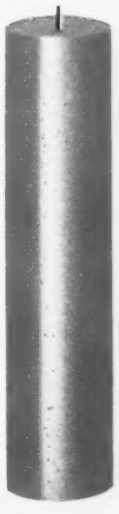
SMITH L-O Core Oil

Smith L-O gives you those bang-up results because of its uniform high-quality PLUS various grades to suit your particular conditions. This enables you to work with an oil "tailored" to the casting of such metals as aluminum, magnesium, grey iron, malleable, or steel. By the same token, this *fast-drying* oil responds well to oven temperatures from 350° to 500° thus giving you a very flexible temperature cycle. Tell us your requirements and we'll be glad to recommend the grade of Smith L-O best suited to your needs.



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Smith L-O Core Oil

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INDUSTRIAL OILS DIVISION • ROCKFORD, ILLINOIS

Safety Meetings Pay Off

SAFETY meetings pay off at the foundry of National Cash Register Co., Dayton, O. A medium-sized operation, the foundry recently completed more than a year of production without a lost-time accident.

Members of the foundry safety committee represent all phases of foundry work. They meet once a month with supervision and the safety director to discuss problems and promote ideas of overcoming accident hazards. Two members of the department committee also serve as representatives of the foundry at monthly general meetings at which all departments of the company are represented. Dealing with safety problems before they cause accidents, or upon recognition of such problems before the committee, has played an important part in making the foundry a safe place to work.

Many methods are used to keep employees alert and aware of potential dangers. When the cupola bottom is dropped, for example, a siren blows to warn employees to stay out of the area. Large signs remind them not to enter or leave the area while the siren is blowing.

During operation of the cupola, metal screens keep sparks flying out the slag hole from rebounding into the working area. A switch to control the high-frequency furnace which brings nodular iron back up to correct pouring temperature after mixing in a ladle is located outside the furnace area. If trouble occurs, the furnace can be cut off from that point.

The department has maintained its enviable safety record in spite of the diversity of metals and processes it employs. Castings are produced in gray iron, nodular iron, brass and bronze and aluminum. Processes used include sand molding, die casting, centrifugal casting and investment molding. Accompanying illustrations show some of the equipment and methods which have made the National Cash Register foundry a safe place to work.

A dead-man control on the sand-cutter automatically cuts power when the operator leaves his seat

The safety committee of the foundry department meets monthly to discuss conditions and hazards. It gets credit for many safety factors in force

Trio of employees models equipment furnished for their protection and worn on jobs in the foundry

When handling molten metal, employees get complete protection from safety shoes, leggings and goggles

Determination of Iron in Brass May Be Inaccurate

Common Method Produces Consistently Low Results

By Frank J. Versagi*

BECAUSE of a basic inaccuracy in the common method of determining iron in brass casting alloys, it is possible for an ingot maker to supply and a foundry to accept unsuitable brass ingot. Further, it is possible for the foundry unknowingly to ship castings in which excessive iron content will cause machining difficulties.

It is common practice to determine iron on the electrolyte left after filtration of the tin and electrolytic removal of the copper. This practice is, however, grossly inaccurate for even the routine determination of iron. If the iron is well below the maximum specification, the inaccuracy may not be critical. If the iron is above the maximum specification, it is possible for the foundry to accept unsuitable ingot, for the error in the method is such that the iron results are erratically, but consistently, *low*.

The data in Table I were obtained by having a chemist run irons on electrolytes supplied by several technicians and comparing the results to the known iron contents of the samples.

TABLE I—Typical Comparative Results Showing Error in Iron Method

Iron Present	Iron Found (Electrolyte)	Iron Found (Separate Sample)
0.26%*	0.21%	0.26%
	0.15	0.25
	0.18	0.26
0.09	0.03	0.09
	0.07	0.10
	0.05	0.09
0.35	0.25	0.37
	0.22	0.35
	0.31	0.34

* Bureau of Standard Sample

The source of error lies in the relative inability to reproduce reliably conditions during the precipitation, settling, and filtration of the tin as metastannic acid. Conditions vary from time to time, from operator to operator and from laboratory to laboratory.

One ingot maker, for example, was supplying a foundry with ingot showing a certificate analysis of from 0.15 to 0.22 per cent iron. The foundry laboratory found the iron to be above 0.25 per cent in several cases. The difficulty was located when it was established that the supplier was determining the iron on the electrolyte, whereas the foundry was determining iron on a separate sample, without previous separation of the tin.

Since the source of error is in the tin precipitation and filtration, it makes no difference whether the method for iron used on the electrolyte is gravimetric, volumetric or photometric. Varying amounts of iron always will remain in the tin precipitate.

Several methods are available for the determination of iron on a separate sample, and these may be found in such classical texts as Scott's[1]. The method most suitable from the viewpoint of speed and good routine precision is that of Sherman[2].

*Chief chemist, Mueller Brass Co., Port Huron, Mich.

References

1. Scott, Standard Methods of Chemical Analysis, D. Van Nostrand, New York.

2. Sherman, "Iron in Brass and Bronze: Rapid Colorimetric Determination," *American Foundryman*, Vol. XIV, Dec., 1948.

3 IMPORTANT FEATURES of

FOX Swing Frame GRINDERS

- **Perfect center balance** of wheel and motor ensures grinding ease and efficiency.
- **"Worker safety"** is carefully provided.
- **Greasing** required only once every six months . . . guaranteed for two years against repairs, exclusive of electrical equipment.

FOX GRINDERS, Inc.

OLIVER BUILDING PITTSBURGH 22, PA.

Bigger Loads... Less Spillage

...more Productive capacity

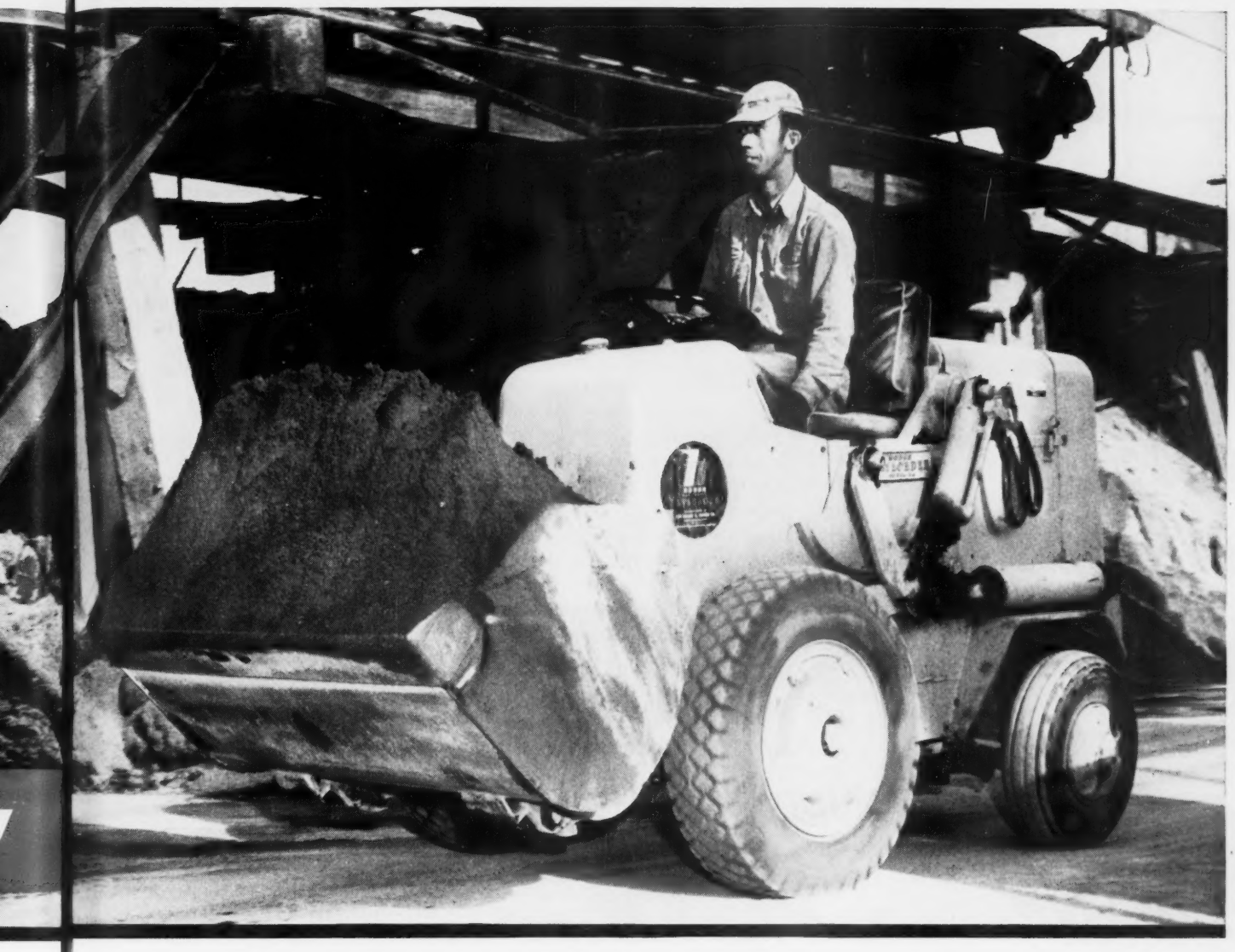
It's the amount of bulk-material *delivered* per shift or per day that counts, and the new model HA "PAYLOADER" tractor-shovel has proven in plant after plant that it consistently delivers more material faster and at less cost than heavier machines with larger engines.

A big reason for this superior performance is the roll-back bucket action that scoops up heaping loads and carries them *low*. Another, is the exclusive built-in hydraulic shock absorber that cushions the load during travel — reducing spillage and allowing higher travel speeds.

Gets more: Forty degree tip-back of bucket at ground level gets heaped loads.

Keeps more: Maximum bucket tip-back is reached *before* bucket is raised—less spillage at pile.

Carries more: Exclusive hydraulic shock absorber cushions the load during transport — less spillage while carrying.



"PAYLOADER" superiority on bulk-material handling work is the result of 34 years of pioneering and leadership in tractor-shovel manufacture. "PAYLOADER" is also the complete, proven line — from 14 cu. ft. to 2¼ cu. yd. capacity — a size for every purpose. There is a nearby Distributor ready to serve you.

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This booklet contains performance reports of "PAYLOADER" tractor-shovels in a variety of plants and applications. A copy will be sent on request, without obligation.

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Foundry Group Meetings

New England: The first monthly meeting of the new AFS chapter was held Apr. 11 at the University Club, Boston, with 180 members and guests attending. William W. Maloney, general manager, AFS, presented the chapter president with the traditional cast iron rattle. Frank Shipley, Caterpillar Tractor Co., Peoria, Ill., national vice president, AFS, congratulated the chapter upon its affiliation with the national group. H. L. Ullrich, eastern regional director, AFS, also spoke briefly.

Raymon Meader, Whitin Machine Works, Whitinsville, Mass., presented the following nominations which were unanimously endorsed as officers for the next year: President, Albert M. Nutter, E. L. LeBaron Foundry Co.; vice president, Clyde Armstrong, Warren Foundry & Pipe Corp., and secretary-treasurer, Thomas I. Curtin Jr., Waltham Foundry Co.

Executive committee consists of Mr. Armstrong, chairman; C. W. Hutchins, Standard Foundry Co.; Alexander Beck, Whitman Foundry Co.; William Ohlson, Draper Corp.; Frank Benoit, Brown & Sharpe Mfg. Co.; William Hale, Springfield Foundry Co.; Romeo Lemoine, Fitchburg Foundry Co.; Warren Murdock, Helantha Corp.; Philip C. Smith, General Electric Co.; Herbert H. Klein, Klein-Farris Co.; Fred Holway, Mystic Iron Works; Howard B. Nye, Marlborough Foundry Co. and Charles A. Reed, Charles A. Reed Co.

Albert B. Steck, plant metallurgist, General Electric Steel Foundry, Everett, Mass., discussed the "CO_2-Water Glass Process" and included comments concerning the steps his company has taken to overcome shakeout problems.—*Fred Holway, Mystic Iron Works.*

Pittsburgh: "Factors for Profitable Foundry Operations" was subject of M. J. Kellner, superintendent, Trafford, Pa., foundry of Westinghouse Electric Corp., as he addressed the AFS chapter on Apr. 16 at Webster Hall Hotel, Pittsburgh.

Mr. Kellner demonstrated how proper planning of foundry engineering, training and safety can pay dividends to the foundryman. First he pointed out that many foundries could and should do a better job of selling themselves and the industry. "Between 1951 and 1955, number of foundries in the U. S. increased by 350, while gray iron foundries dropped by about 257 in that same period. Some individual foundries expanded, but others probably did not do a good selling job," he commented.

In addition to selling the product, Mr. Kellner pointed out that foundries should improve their salesmanship of the foundry industry to young, prospective workers. "Foundries that keep clean and attractive are in a better competitive position. They can cut labor turnover and win new workers."

"Safety measures are another method of improving foundry operations," the speaker continued. With a well-organized approach to safety,

STOP
WASTING
GRINDING WHEELS
AND
INCREASE PRODUCTION
with the famous
STANDARD
infinitely
variable speed
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TURN HAND WHEEL—automatically adjusts guard, increases spindle speed in relation to worn wheel—you get FULL WHEEL WEAR DOWN TO FLANGES! Foundries report as much as 100% increase in wheel life.

INFINITELY VARIABLE SPEED means proper peripheral speed at all stages of wheel wear—AS MUCH AS 60% INCREASED PRODUCTION FROM CONSTANTLY CORRECT WHEEL SPEED AT POINT OF GRINDING!

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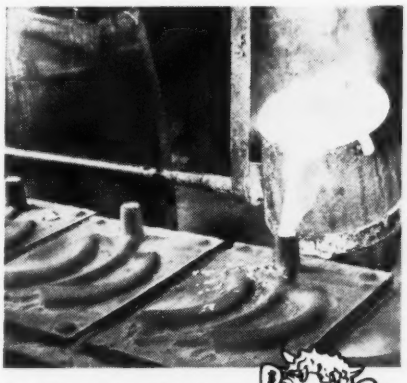
"Get rigid, warp-free shell molds with Borden resins"

Foundry operators using the shell mold process find they get better castings when molds are made with Borden THOR MCF-7 resin. It assures full-thickness build-up . . . helps produce a flat, rigid, warp-free shell that strips off the pattern quickly and cleanly.

If you use shell molds and would like the best in casting finish, contact us today for a trial run with a Borden foundry engineer to assist. The Borden Company, Chemical Division, Dept. F-66, 350 Madison Avenue, New York 17, N. Y.

Urea, Phenolic and Oil Soluble Resin Core Binders . . . Shell Mold Resins . . . Core Spray . . . Core Paste . . . Parting Agents.



FOUNDRY RESINS

THE Borden COMPANY CHEMICAL DIVISION

©T.B.C.

New Core-Curing Technique Developed by Borden Engineers

New York, N. Y.—From the Foundry Department of the Borden Company, Chemical Division, came news today of a remarkable new core-curing process to answer the growing demand for dimensionally perfect cores that can be produced at a faster rate than is possible to date.

As explained by Mr. Donald J. Murray, Foundry Manager, it is a "cured-in-the-box" method developed after intensive experimentation and testing in Borden laboratories.

Borden foundry engineers found that—using conventional urea core binders—a stream of heated air blown through a properly vented box would bake the core to exact core-box dimensions in a short period of time.

Many Operational Advantages Cited

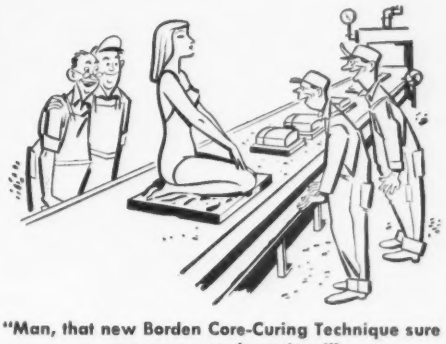
Mr. Murray, indicating some of the advantages of this process, stated, "It is an extremely economical process, since only heated air is used. Also, since cores can be set immediately after release from the box, more castings can be turned out in a day." He added that the danger of core-sag and breakage is eliminated, especially with small intricate cores. Moreover, since cereals and release agents are omitted, not only is the mix simplified . . . but harmful formulation of gas in cores is reduced.

Helps Produce Better Castings

Along with all these advantages, Mr. Murray emphasized, this process retains the smooth core surfaces characteristic of resin binders . . . and therefore assures smooth, clean castings.

Full Information Available

Foundry operators interested in this new technique can obtain full information from Borden, Mr. Murray stated. Write to The Borden Company, Chemical Division, Foundry Dept., F-66, 350 Madison Ave., New York 17, N. Y.



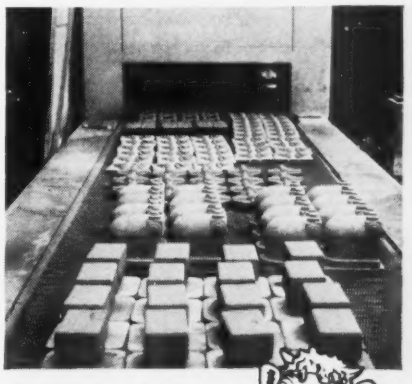
"Man, that new Borden Core-Curing Technique sure gets you smooth castings!"

"Get smooth, hard cores with Borden resins"

If cores are a problem in your foundry operation . . . you'll do well to give Borden core binders a try. They assure clean, smooth, hard cores. They help reduce scrap. They speed production through faster bake-out, assure easier shake-out, eliminate smoke so working conditions are better.

To get the most out of your equipment, let a Borden foundry engineer set up a test run of Borden resin core binders. Contact The Borden Company, Chemical Division, Dept. F-66, 350 Madison Avenue, New York 17, N. Y.

Urea, Phenolic and Oil Soluble Resin Core Binders . . . Shell Mold Resins . . . Core Spray . . . Core Paste . . . Parting Agents.



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Strayer Electric Buckets have an almost unlimited range of applications. They can be used whenever there is electricity, inside or out-of-doors. You can attach them to any type of power hoist or crane.

You'll get lower material handling costs with a Strayer Electric Bucket. Design and construction assure you of that.

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From top to bottom, the Strayer is strongly built for long, steady use, even under extreme conditions. It requires very little service.

Check these features. They're only a few of the reasons why Strayer Electric Buckets mean lower material handling costs.

- Operates in its own headroom.
- Empties full or part load.
- No clutches, chain or leaf springs.
- Crane with lifting magnet needs no extra wiring.
- Wide scoops make it clean up as well as digging bucket.
- Automatic controls prevent accidental opening or closing.
- Smooth, steady action. No sudden shock thrown on crane.
- No blind rivets. Generous size bushings and hinges.
- Hooks on or off in a minute.
- Digs full or part load.

Erie Mechanical Hook-On and Two-Line Buckets Also Available in a Complete Range of Sizes

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the Trafford foundry successfully worked 451 days without a lost-time accident recently. "To institute a good safety program, you should interest top management in your plans," Mr. Kellner said: "Institute a housekeeping program and keep it going—improve workers' interest in efficiency, and you'll have a more profitable foundry operation."—*Robert M. Love.*

Connecticut: Waverly Inn, Cheshire, Conn., was the meeting site for the AFS chapter on Apr. 24. Marc Uebel, technical representative, International Nickel Co., outlined recent advances of nodular iron. In addition to a film, the speaker used slides to further illustrate specific physical and mechanical properties of this type of cast iron.

Several favorable factors were cited for using nodular iron instead of certain other materials: Its tensile and Izod-impact properties are superior to gray iron, its wear resistance is better than bronze for some applications and its dampening capacity makes it a logical conversion from steel where vibration noise in service is a consideration.

In discussion one member remarked that the cast-to-size tensile bars specified for magnesium, aluminum and malleable iron more nearly represent the mechanical properties possessed by commercial castings of comparable section size than the customary keel-block machined specimens used in determining the reported properties of nodular iron.

Another member stated that over a seven-year period he had found that malleable iron machined consistently better than other ferrous alloys, including nodular iron procured from a number of different sources. Mr. Uebel agreed that since malleable iron is a highly controlled product more uniform properties understandably could be anticipated.—*Gordon B. Mannweiler, Eastern Malleable Iron Co.*

San Antonio Section: A trio of films—one scenic, one comic and one educational—were shown to 51 members and guests of the AFS chapter at its Mar. 26 meeting at the Alamo Iron Works, San Antonio. Refreshments were sponsored by the F. & J. Pattern Works.—*Frank A. Fournier Jr., F. & J. Pattern Works.*

Wisconsin: Three group sessions and election of officers occupied the AFS chapter at its Apr. 20 meeting at Hotel Schroeder, Milwaukee. Gray iron group heard George Antonic, superintendent, Motor Castings Co.,

Quality starts in the furnace!

Jenkins Bros. uses nine Detroit ROCKING Electric Furnaces to melt bronze for valves

Top grade valves require top quality castings. And top quality castings require metal that is *right.*

Jenkins Bros., makers of fine valves for almost a century, have 9 Detroit Rocking Electric Furnaces, with a combined capacity of 7700 lbs. per hour, to melt bronze of the necessary high quality.

PRECISE CONTROL OF ANALYSIS—Melt-analysis can be controlled very exactly in these great furnaces, with metal of the desired characteristics produced in heat after heat. Accurate temperature control allows establishment of the most advantageous pattern for operation, and duplication of that pattern for each melting cycle. The rocking action of the furnaces assures homogeneous melts and a more complete utilization of generated heat because of the flow of molten metal back and forth on the lining.

NOTE THESE ADVANTAGES—Other important advantages of Detroit Rocking Electric Furnaces are economy of power consumption, minimum heat loss, less metal shrinkage, fewer scrap castings, more heats per shift or working day, reduced out-of-production time because of long refractory wear and simple shell replacement, trouble-free operation.

Detroit Electric Furnaces range from 10 lbs. to 4000 lbs. capacity, individually designed to fit your plant's electrical specifications. They melt ferrous and non-ferrous metals with equal efficiency.

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- MALLEABRASIVE is patented because of its own distinctive metallurgical characteristics.
- MALLEABRASIVE is produced only by manufacture under the full and complete MALLEABRASIVE process—used by Globe exclusively.

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Milwaukee, talk on "Gating of Gray Iron Castings." Frank Kulka of the same company acted as chairman. Robert Clark, plant engineer, Dalton Foundries Inc., Warsaw, Ind., spoke to the malleable group on "Reduction of Man Hours by Proper Utilization of Existing Facilities." C. W. Gutenkunst III, Milwaukee Malleable & Gray Iron Works, served as chairman.

"Sand Casting Aluminum Alloys" was discussed with the nonferrous group by Paul D. Frost, chief, light metals division, Battelle Memorial Institute, Columbus, O. E. H. Jagmin Jr., Ampco Metal Inc., was chairman. The steel group heard Don Gerlinger, SPO Inc., Milwaukee, present "A Practical Approach to Modern Molding Methods." Richard Koch, Wehr Steel Co., chairmanned this group.

Officers for the 1956-57 season are: President, Prof. George J. Barker, University of Wisconsin; vice president, Norman J. Amrhein, Federal Malleable Co.; secretary, Leslie J. Woehlke, Grede Foundry Inc., and treasurer, Bradley H. Booth, Carpenter Bros. Co. Directors elected were John McBroom, Stainless Steel & Engineering Co., H. Wesley Stokes, Kilbourn Pattern Inc., and Erich M. Sobota, Wisconsin Electric Power Co.—*John E. Hubel.*

Cleveland Non-Ferrous: Members of the Cleveland Non-Ferrous Founders' Society met Mar. 16 at the Cleveland Athletic Club, Cleveland, to hear Jack Orr and George Elliott, purchasing agents for Thompson Products Co. and W. J. Schoenberger Co., respectively, discuss "What the Purchasing Agent Expects from the Non-Ferrous Foundry."

Mr. Orr said he expected three things: Reasonable price, quality and service. He desires the foundry to keep accurate cost records, to use the learning curve and to add a reasonable profit. Delivery promises should be fulfilled. Castings that Mr. Orr buys must meet strict company and military specifications usually involving rigid dimensional tolerances. He urged foundries to educate their personnel as to what the customer expects.

Mr. Elliott spoke on the price structure of brass castings and indicated there were wide differences in the area for them. He feels that accurate cost records would help improve this condition. He recommended that foundries keep a closer watch on pattern equipment, have better quality control and inspection standards and ship a nice appearing casting.

On Apr. 19, approximately 50 members and guests met again at the CAC to hear "Aluminum Foundry Practices and Casting Defect Cor-

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Brass, Bronze, Copper

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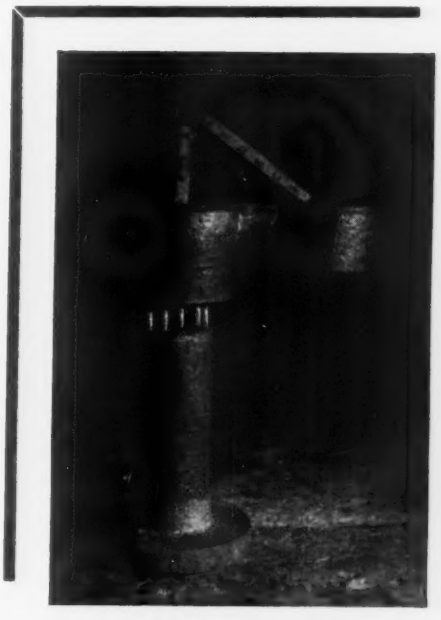
300 lb. aluminum bronze bearing cap cast with THERMOTOMIC feeding ring core under riser. Note small feeder opening which facilitates removal of riser from casting, resulting in greatly reduced cleaning costs.

NOTE THESE TYPICAL RESULTS FROM THE USE OF SOFFEL'S *Carbon Free* LIQUIDIZER

With the application of 1 pound of SOFFEL'S CARBON FREE LIQUIDIZER, this 6" x 6" chrome-nickel-steel riser was reduced in weight from 32 pounds to 13 pounds average. A savings of 19 pounds of salable metal, normally discarded as scrap, was fed into the casting and produced a heavier, sounder casting. Note the feeding head can be knocked off easily, saving burning costs. There is no better feeding head compound at any price than SOFFEL'S CARBON FREE LIQUIDIZER.



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Made by direct pouring through the Thermotomic strainer core under the feeding head.

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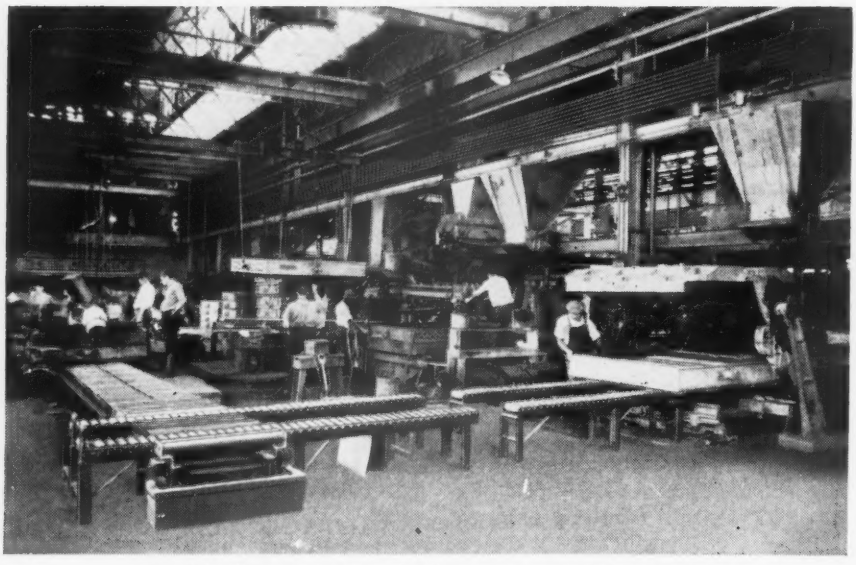

Parallel roller conveyor lines facilitate movement of large molds to pouring area. Note simple right angle transfer device.

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GOOD foundry practice requires smooth handling of molds and cores to reduce losses due to "shifting" or "collapse".

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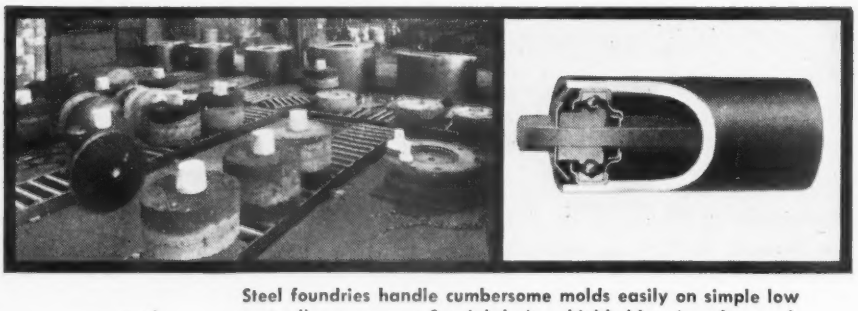

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rection" by Donald L. La Velle, assistant manager, Aluminum Dept., Federated Metals Division, American Smelting & Refining Co., Barber, N. J.

Mr. La Velle enumerated some of the most common defects in aluminum castings and explained how to avoid them. Flux inclusions, for example, can be eliminated by preventing fluxes from getting beneath the surface of the melt. To prevent iron pickup from iron crucibles, coat the crucibles.

To avoid gas porosity, eliminate moisture, which is the source of hydrogen. Since hydrogen solubility increases with temperature, don't overheat aluminum. If a melt turns out gassy in spite of precautions, degas it. Pills of flux are the most convenient type of degasser, but they should be used only one-half pill at a time. A little gas will help to avoid shrinkage.

Mr. La Velle emphasized that aluminum is an easy metal to work with, but, as with all metals, certain basic principles must be adhered to. The most neglected point in aluminum practice is pouring. Because the metal is light, air mixes with it readily during pouring. Consequently, aluminum must go into the sprue absolutely quietly. The first metal poured should fill the sprue. The ladle should be right at the mold.

Aluminum is especially sensitive to poor gating. The metal should be distributed evenly to avoid overheating any one spot. Curved gates cause agitation and gas. Pencil gating will not work in aluminum. Rat tails are caused by flaws in the sand. In heat treating, quench aluminum castings in boiling water.—*Walter O. Larson Jr., Grafton Foundry Co.*

Washington: A foundry symposium featured the Mar. 22 meeting of the AFS chapter at the Stewart Hotel, Seattle, Wash. Fifty-five members were present. John Butterfield, sand technician, Washington Iron Works, spoke on "Good Sand Needs Attention, Too." He said that good venting of cores and molds, clean molds and attention to details of good molding practice are important if quality castings are to result from using good sand. Harold Wolfer, quarterman molder, Puget Sound Naval Shipyard, discussed "Melting Aluminum in an Indirect Arc Furnace."

Mike Zylstra, associate professor, University of Washington, talked on "Pressure Feeding of Sand Castings." He showed slides of experimental work now being done at the university on pressure feeding of aluminum sand castings. Stan Marshall,

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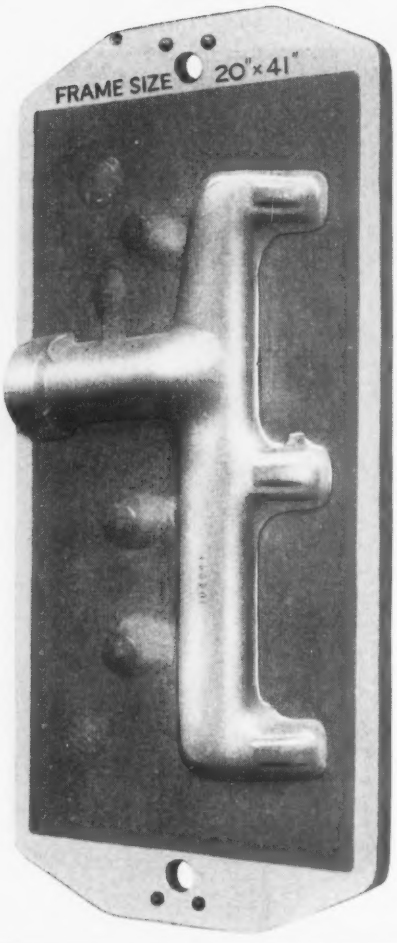

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This Drier pattern for a diesel intake manifold is made from an original master pattern. *Only one skrinkage!* Pattern was used for 500 pieces. Only 3½ hours labor and 50 pounds of TAMASTONE were required. Up to 1,000 castings have been made from a plate of this type!

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Here are two well-balanced charging Wheelbarrows for heavy duty foundry service. Handle loads up to 1000 lbs. Sturdy, welded, all-steel construction. Single wheel or double wheel. Available with zero pressure cushion type wheels or 4 ply pneumatic tired wheels with roller bearings. Immediate shipment.

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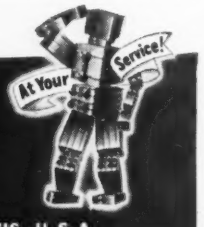

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foundry engineer, Atlas Foundry & Machine Co., talked on "Is Design Important?" He offered examples of proper and improper design and stressed the importance of educating customers that properly designed castings are more economical and a better product than are those improperly designed.

Forty-one members and guests of the chapter met at the Poodle Dog Cafe, Tacoma, Wash., on Apr. 19 to hold the annual election of officers, announce apprentice contest winners and hear a talk by Frank G. Steinebach, editor, FOUNDRY, on "Can We Sell More Castings?"

Mr. Steinebach traced and reviewed the development of the foundry industry for the past 30 years. He emphasized that more castings can be sold if a better job of merchandising is done by the industry. Production-wise, foundries must eliminate high losses and waste, improve customer relations and train personnel for increased production. Research should take on increased importance and the efforts of the AFS and other technical groups should be used and promoted. Pricing should be brought up to date because some foundries are giving away a part of their plant every time they price a casting.

Newly elected officers for 1956-57 season are: Chairman, Harold R. Wolfer, Puget Sound Naval Shipyard, Bremerton, Wash.; vice chairman and membership chairman, William K. Gibb, Atlas Foundry & Machine Co., Tacoma, Wash.; secretary, Fred R. Young, E. A. Wilcox Co., Seattle; treasurer, Jack W. Uren, Fire Brick Supply Co.

Leon Morel Jr., Morel Foundry Co., apprentice contest chairman, announced the names of winners in the chapter's apprentice contest: Steel Molding—First, Nathan Rosier, Atlas Foundry Co.; second, Naman Peterson, Puget Sound Naval Shipyard. Cast Iron Molding—First, Harold Van Haitsme, Atlas Foundry Co.; second, Don Franks, Atlas Foundry Co. Wood Patterns—First, Herb Nelson, Pacific Pattern Works; second, Ed Poole, Washington Iron Works.

In the national apprentice contest, Messrs. Nelson and Poole were awarded first and second prizes, respectively, in the wood pattern division.—*E. F. Riedle, Puget Sound Naval Shipyard.*

Northern California: "Can We Sell More Castings?" was the theme of Frank G. Steinebach, editor, FOUNDRY, on Apr. 16 as he addressed the AFS chapter at Spenger's Cafe, Berkeley, Calif. The speaker interspersed his talk with highlights of

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We figure there's nothing that foundries appreciate more, in abrasives, than uniformly high quality. So, that's what we shoot for in the production of SUPER-ANNEALSHOT. You'll find it a malleable shot of thoroughly dependable quality—the finest you've ever used. And, you'll also appreciate its low cost. Efficient mass-production permits our selling this outstanding abrasive at very reasonable prices. If you haven't yet tried SUPER-ANNEALSHOT—you should!

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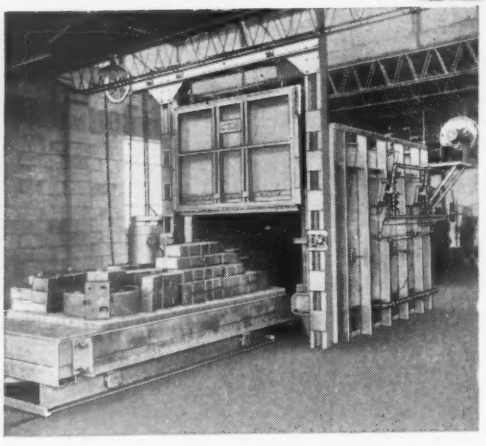

Engineering experience is apparent in the smooth operation of the Jonhston Car Bottom Furnace. Roller bearings in car and door hoist shafts mechanical car seals, and power operated car pullers are just a few of many practical features. Johnston "Reverse Blast" low pressure burners for oil or gas assure clean, economical, efficient heat for annealing, normalizing, and stress relieving.

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● Melting Furnaces ● Heating Torches ● Ladle Heaters
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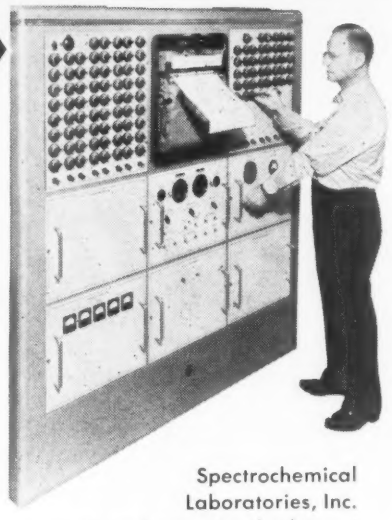

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the castings industry since the turn of the century, showing progress in materials, machines and methods. He stressed that more castings can be sold if foundrymen examine critically their own production, research, pricing and promotion operations. Mr. Steinebach praised the work of the National Castings Council and the Foundry Educational Foundation for their efforts in promoting the welfare of the foundry industry.—*Harold R. Hirsch, American Manganese Steel Div., American Brake Shoe Co.*

Northeastern Ohio: Two hundred and twenty-three members and guests of the AFS chapter met Apr. 12 at Tudor Arms Hotel, Cleveland, to honor national officers and apprentice contest winners and see a film on the CO_2 process.

William W. Maloney, general manager, AFS, spoke briefly on the program of the society's 60th annual convention. Frank J. Dost, Sterling Foundry Co., Wellington, O., immediate past president, AFS, remarked on the work being done by the national office and reported that all was well and the organization was in capable hands.

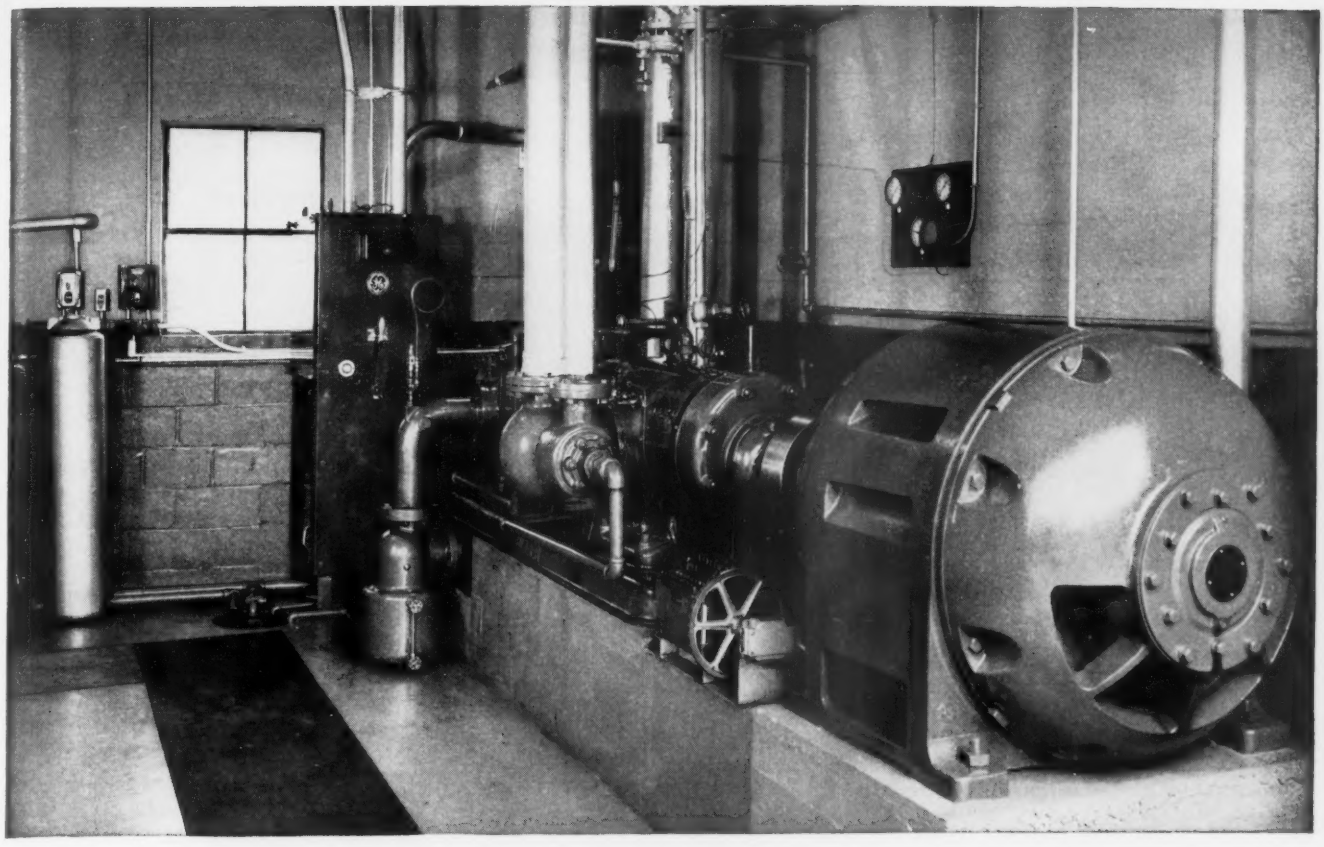
Frank Cech, Cleveland Trade School, national director, talked about the volume of work done by AFS committees and regional directors in laying out an educational program that does not conflict with the Foundry Educational Foundation.

D. C. Courtwright, principal, Cleveland Trade School, reported on the progress of the new $3½ million school now under construction and which should be ready for complete occupancy in about another year.

Walter L. Seelbach, Superior Foundry Inc., past national AFS president, attended the meeting and was introduced.

E. Claude Jeter, Ford Motor Co., chairman of the educational committee, presented checks to these winners in the chapter's annual apprentice contest: Non-Ferrous Molding—First, Wilbur Freeman, Harsch Bronze & Aluminum Foundry; second, Hershel Chandler, Harsch Bronze & Aluminum Foundry; third (tie) Melvin Stokes, Harsch Bronze & Aluminum Foundry and Andrew Gerda, Wellman Bronze & Aluminum Co. Ferrous Molding—First, Lawrence Perlatti, Fulton Foundry & Machine Co.; second (tie) Isaiah Doll, Hill Acme Co. and Robert Watkins, Fulton Foundry & Machine Co.; third, Robert Cochrack, Fulton Foundry & Machine Co.

John Roth, Cleveland Standard Pattern Works, representing the Pattern Manufacturers Group, Associated Industries of Cleveland, presented checks to these apprentice contest winners: Wood Patterns—First, Vin-



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FULLER ROTARY COMPRESSOR AT EMPIRE STEEL CASTINGS, INC.

Compressed air, supplied by a Fuller Rotary Two-stage Compressor, is used for many foundry operations at Empire Steel Castings Company, Reading, Pa. This machine has a capacity of 680 c.f.m., 100-lb. pressure.

Many operations are mechanized, using compressed air. Pneumatic rammers; squeeze and jolt machines; automatic set-out and lifting in connection with mold conveyors; automatic shakeout; mold cleaning and spraying. Drying; core oven and core blowing. Chipping hammers and grinders; blacksmith requirements; sand blasting; and pressure testing—a whole group of operations simplified by the use of compressed air supplied by the Fuller Rotary Compressor.

After constant, day after day operation for one year, (approximately 4000 hours operating time) it was found, upon inspection, that this machine was in first-class condition in every respect—in fact, maintenance for the period was nil.

In your own operation, compressed air can save time and money . . . especially when it is supplied by reliably efficient Fuller Rotary Compressors. Don't overlook the advantages of air power—put it to work.

Fuller Rotaries are built for capacities to 3300 c.f.m., 125-lb. pressure. For complete information, write for Bulletin C-5A.

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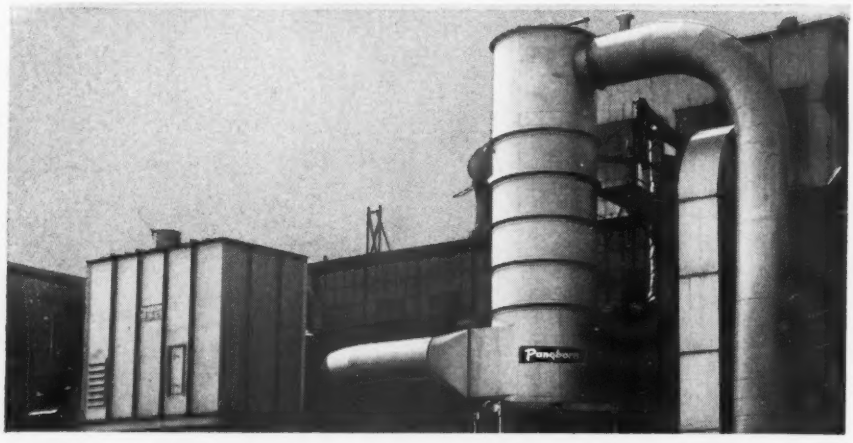
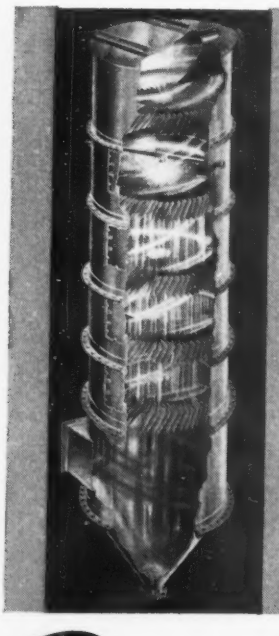


FARRELL-CHEEK STEEL CO., Sandusky, Ohio, uses a Pangborn Cloth Screen Collector for dry dust and a new Pangborn Centrifugal Wet Collector for hot and moist dust from shakeout and burning stations. According to Farrell-Cheek, "We are well-pleased with the Pangborn Wet Collector. It does its job efficiently, economically, and we have encountered no maintenance difficulties whatever."

Pangborn Centrifugal Wet Collector



For effective control of hot, moist, inflammable, abrasive, corrosive and obnoxious dust

Effective interaction of air and water explains the efficient performance of this new Centrifugal Wet Dust Collector by Pangborn. Dust-laden air enters the bottom of the collector tangentially and heavy dust particles are immediately precipitated by centrifugal action. Patented vanes cause the air to ascend on a tortuous centrifugal path, exposing it to thorough cleansing by descending water, after which it discharges through the top. Unique Pangborn counter-current design results in greater efficiency of operation, reduced space for rated capacity, lower operation cost through reuse of water and capacity geared to individual needs.

Pangborn CONTROLS DUST

If *your* dust problem involves the control of dust difficult to handle with a dry collector, write for details on the new Pangborn Centrifugal Wet Collector! Send for Bulletin 919 to PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control and Blast Cleaning Equipment.*

cent Veneziano, Royal Pattern Works; second, Douglas Petery, Cove Pattern Works; third, Lewis Backus, Cleveland Standard Pattern Works. Metal Patterns—First, Chester P. Biernot, Ford Motor Co.; second, Herbert L. Zigler, Motor Pattern Co.; third, Stanley Stobierski, Cove Pattern Works.

In the national apprentice contest, the local area provided three winning entries. In the metal pattern division, Messrs. Zigler and Stobierski were awarded first and second prizes, respectively. In the wood pattern division of the national competition, Mr. Backus placed third.

David Clark Jr., Forest City Foundries Inc., chairman, nominating committee, announced the following nominees for officers for 1956-57: Chairman, Alexander D. Barczak, Superior Foundry Inc.; vice chairman, E. Claude Jeter, Ford Motor Co.; 2nd vice chairman, Emil Romans, National Malleable & Steel Castings Co.; secretary, Howard E. Heyl, Federal Foundry Supply Co.; treasurer, Harold Strater, North American Refractories Co.

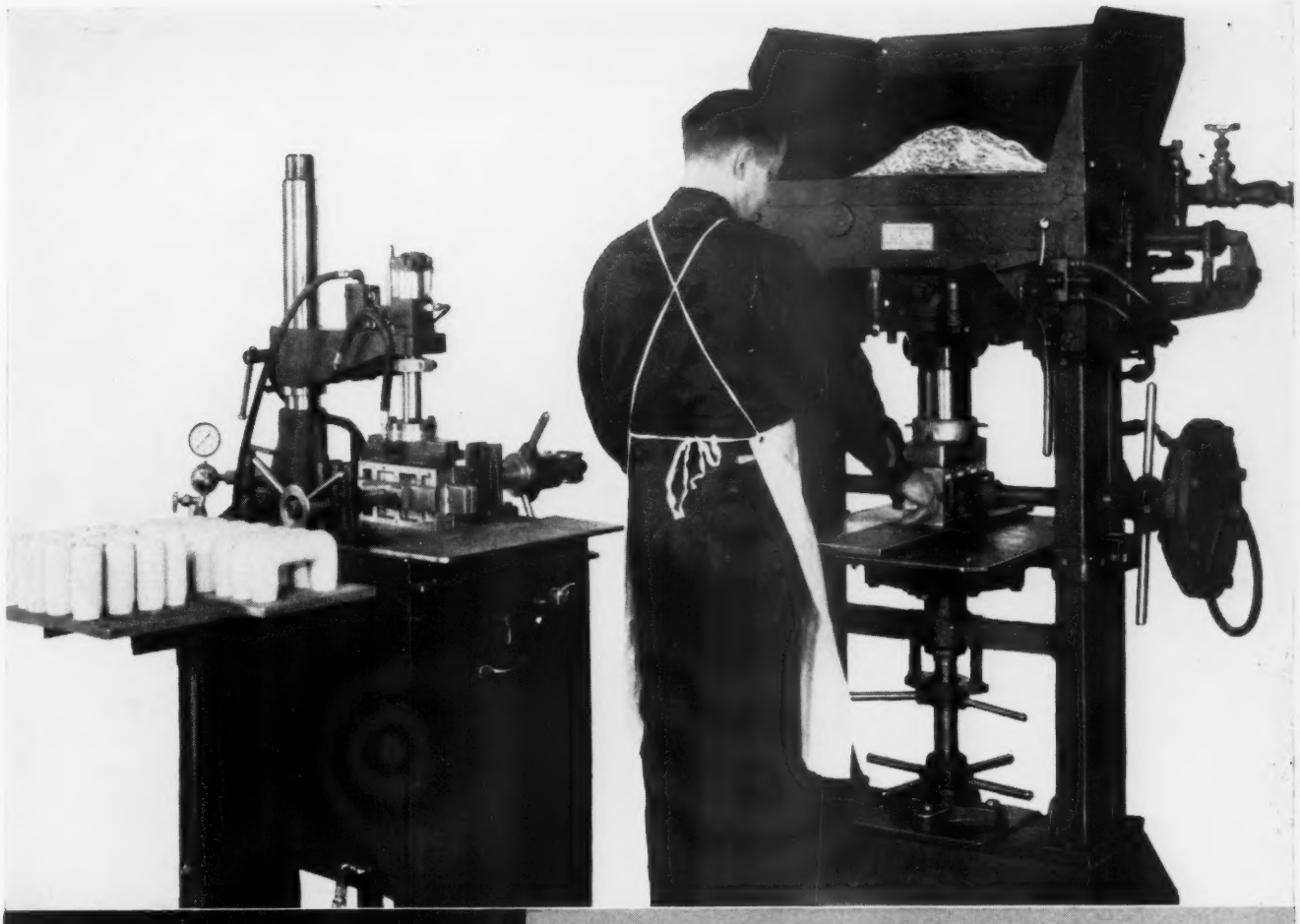
Board of directors includes, three year term: Warner B. Bishop, Archer-Daniels-Midland Co.; E. Robert Brennan, Forest City Foundries Inc.; John H. Sibbison Jr., Kerchner Marshall Co.; Harold Wheeler, Allyne-Ryan Foundry Co.; John F. Wallace, Case Institute of Technology. Board of directors, one year term: John S. Parker, SPO Inc. Lewis T. Crosby, Sterling Wheelbarrow Co., will join the board for one year as immediate past chairman.

An AFS film on the CO_2 process was shown. Daniel E. Krause, executive director, Gray Iron Research Institute, Columbus, O., gave the commentary and led the discussion that followed.

Chapter's annual picnic and golf outing is scheduled for Twin Lakes Country Club, near Kent, O., on June 30.—*Kenneth L. Mountain*

Eastern New York: March meeting of the AFS chapter attracted 60 members and guests to hear F. D. Lordi, supervisor, investment foundry, General Electric Co., whose subject, "Casting of High Temperature Alloys with Superior Properties," developed into a thorough description of the investment casting process.

Emphasis was given to advantages of this casting method for high-temperature applications. Mr. Lordi indicated that investment casting is of particular importance in alloy investigation as well as the production phase of high-temperature development. —*Martin L. Slawsky, Watervliet Arsenal.*



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The *right tools* to assure uninterrupted production if you make cores by the CO_2 Process.

One core box is being blown while another one is automatically clamped, the cores hardened in the core box and the core box released ready to remove finished cores. If core boxes are suitable, cores can be mechanically stripped as shown in the picture at the right.

The Core Hardening Station is completely air operated. Automatic time cycle is quickly adjusted to meet job requirements.

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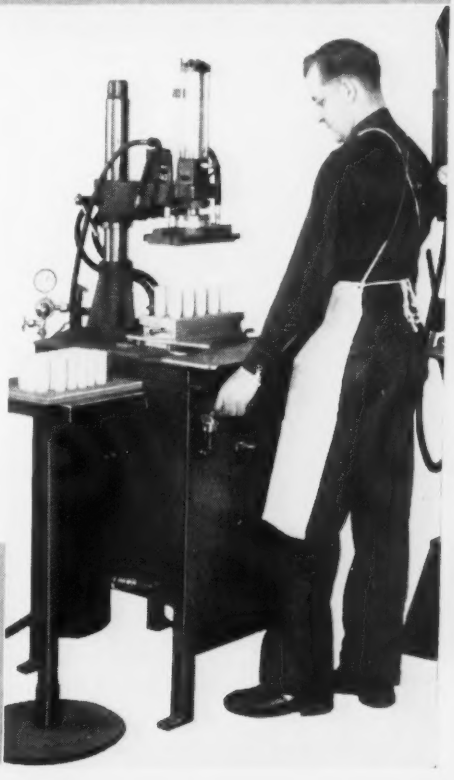

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Reynolds Offers Handbook On Casting Aluminum

Reynolds Metals Co., Louisville, has issued a new technical handbook entitled *Casting Aluminum* which is meant to provide better understanding of the design and production of aluminum castings. It includes clear, concise information to help the designer select the casting process and aluminum alloy best suited for his application. Data on typical mechanical properties also are presented.

Contents cover pig and ingot classifications, effects of common alloying elements, alloy classifications and their characteristics and similar data. Separate chapters cover the six main casting methods—sand, permanent mold, die, centrifugal, plaster mold and precision investment. Important factors involved in each are explained carefully. Other chapters cover design; molding and coring; melting, fluxing and pouring; cleaning and trimming; heat treatment; machining; surface finishing, quality control, etc.

Tables cover a wide variety of data including composition limits for the various alloys, typical mechanical properties at room and elevated temperatures, fabricating characteristics, etc. The table of contents is supplemented by an index of the tabular data and a 9-page, itemized cross-index. The book contains 130 pages and is ring bound to lie flat when open.

A copy will be sent without charge to those who request it on company letterhead. Requests should be addressed to Reynolds Metals Co., Desk PR4810, 2500 South Third St., Louisville 1, Ky.

UCLA Offers Two Courses On Statistical Methods

Two courses devoted to "Statistical Methods in Industry" will be given this summer at the University of California at Los Angeles. The courses will be offered by the department of engineering in co-operation with the university extension and the Los Angeles section of the American Society of Quality Control.

One course will be a basic study of quality control by statistical methods, the other will be an advanced course in industrial statistical methods. Both will meet from 8 a.m. to 5 p.m., Aug. 6 to 17. Fifteen lectures on related topics will supplement the class work.

Fee for either course is $250, which includes tuition, books, supplies, ten luncheons and one dinner. Requests for further information may be addressed to Prof. Edward P. Coleman, department of engineering, University of California, Los Angeles 24.

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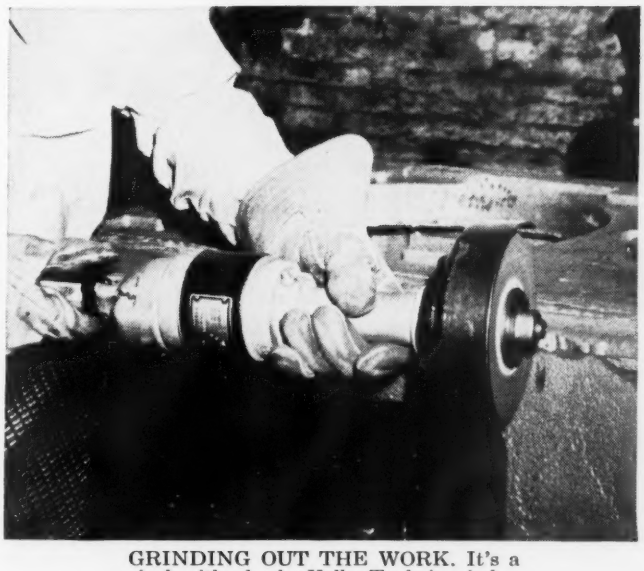

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Trouble Shooting

By C. W. AMMEN

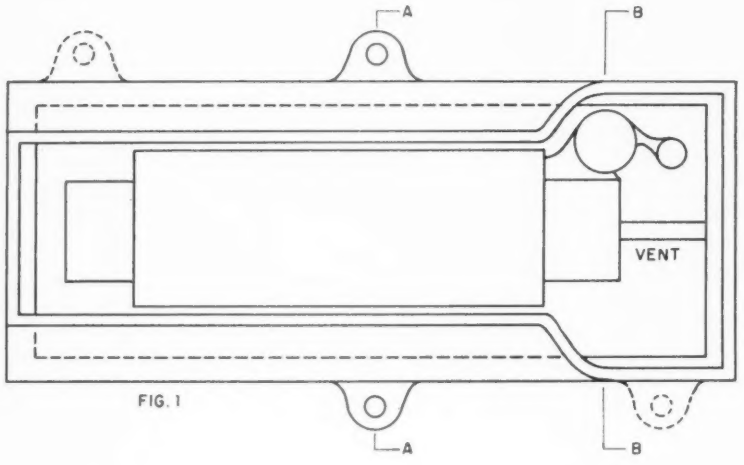

FIG. 1

Fig. 1—View looks down on the top of the flask and of the pattern. In locations of riser, gate and sprue, the top is faired out. Fig. 2—Section AA. Fig. 3—Section BB. Fig. 4—A view of the removable print, which can be designed differently

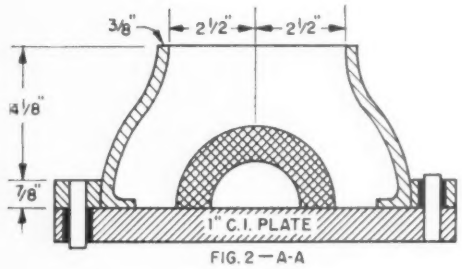

FIG. 2—A-A

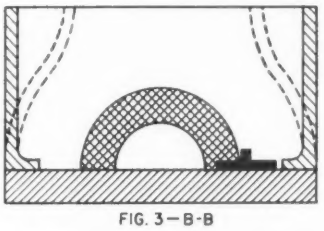
FIG. 3—B-B

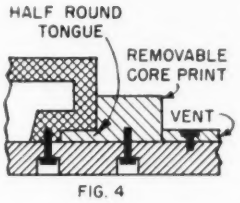

FIG. 4

Making Bronze Bushings

Dear Charlie:

We have on hand an order for a sizable lot of 5-in. OD bushings 13 in. long with 3 and 2½-in. IDs. This job is to be continuous, so far as we can tell, and we have decided to make up some sort of permanent equipment on this job. Production requirements are for approximately 75 castings of each size per day. Our best procedure on bushings of this type is to make them lying down, placing a riser on one end, hooked on alongside the core print, and gating into the riser. These are to be made out of lead lube type metal known as Hi Lead. We're curious to know what type of equipment would be least expensive and tie us up least. We want to use only one molder. What production could we expect? The cores are made on a sausage machine.

Sincerely,
Sam

Dear Sam:

I have, as I am sure you have too, seen bushings made in snaps, chills and cores and upside down, forward and backward, and with varying degrees of success. As you no doubt know, pouring bushings on the side has both advantages as well as disadvantages over pouring them on end. However, give and take a few, one helluva lot of these rascals have been made lying down. As for equipment to make bushings, I don't know of any other item for which there is such a large variety of equipment and rigging.

Most brass shops are called upon from time to time to make bushings, and I have seen some A1 equipment and some equipment that wasn't very good. You state that yours is a continuous run—or at least that you have hopes in that direction. Let's take it from scratch, assuming you have only your sausage grinder for producing the cores. The equipment I would suggest is by no means what you would call cheap initially, but *is* extremely cheap in the long run, and foolproof as can be.

This rigging will produce good, clean molds at a good rate of production with a minimum amount of skill necessary. It also can be used to make smaller bushings by changing the patterns.

The first thing we will consider is the pattern and pattern mount. We will make a half-pattern of aluminum with removable core prints which we will mount on a ground, gray iron plate. It will be exactly centered between the pin on one side of the plate and the bushing on the other, so that both cope and drag are produced from a single pattern. With this, we will make pattern equipment for flasks and make 30 complete gray iron special flasks.

This job might seem like a lot of trouble and expense for such a simple item as a bushing, but one day of production will eliminate any trace of doubt about the wisdom of such

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THE HUTCHINSON SHELL MOLD MACHINE

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expense. Far too little money is spent in the average foundry on special equipment to produce a given item, especially in jobbing foundries. Once this equipment has been built and is in production, your competition could not compete on the item without spending time and money on rigging. This position gives you a decided edge at the outset.

We make up the equipment by first making a suitable gray iron mount with a pin lug on one side and a bushing lug on the opposite side, at right angles to the ends of the mount. The pattern is mounted exactly midway between the pin and bushing centers. This dimension is the important one and must be right on the nose.

Flasks Are All Alike

If the pattern is not centered lengthwise in the flask, it should be closer to the end not gated, to allow suitable room for gating. It is best to drill the pin and bushing holes in the mount and the pin and bushing holes in the flask halves from the same drill jig, to avoid a slip. The flask halves are all alike, each fitted with a pin in one lug and a bushing in the other.

Fig. 1 is a view looking down on the top of the flask and the pattern. It shows locations of riser, gate and sprue. The top in that area is faired out to make space for sprue and riser. The opposite end has only a 5-in. opening, as shown in Fig. 2, which is a sectional view through AA, Fig. 1. The section at BB is shown in Fig. 3.

The outside dimension of the flask halves at the parting is the same as that of the mount, leaving no ledge to catch sand. Suitable handles are provided on the ends for lifting off and handling. Make sure when you drill flask lugs for pins and bushings that they are all alike with respect to the mount. Keep the big end of the flask down on the riser-gate end of the mount. A half-flask with bushing and pin reversed would turn the flask end-for-end with respect to the mount. Section AA in Fig. 2 shows the general shape, which can be varied as desired. Fig. 4 shows the removable print, which also can be designed in other ways, according to the maker's preference.

In operation, the mount is bolted down to a standard 10 or 12-in. jolt squeezer table with a standard air rapper attached to a lug provided for it on the mount. A squeezer board ¼-in. smaller all around than the opening on top of the flask, and the same shape as the flask opening, is mounted to the squeeze head. A sprue and riser button is mounted on the board in the correct position.

With everything in position, a little

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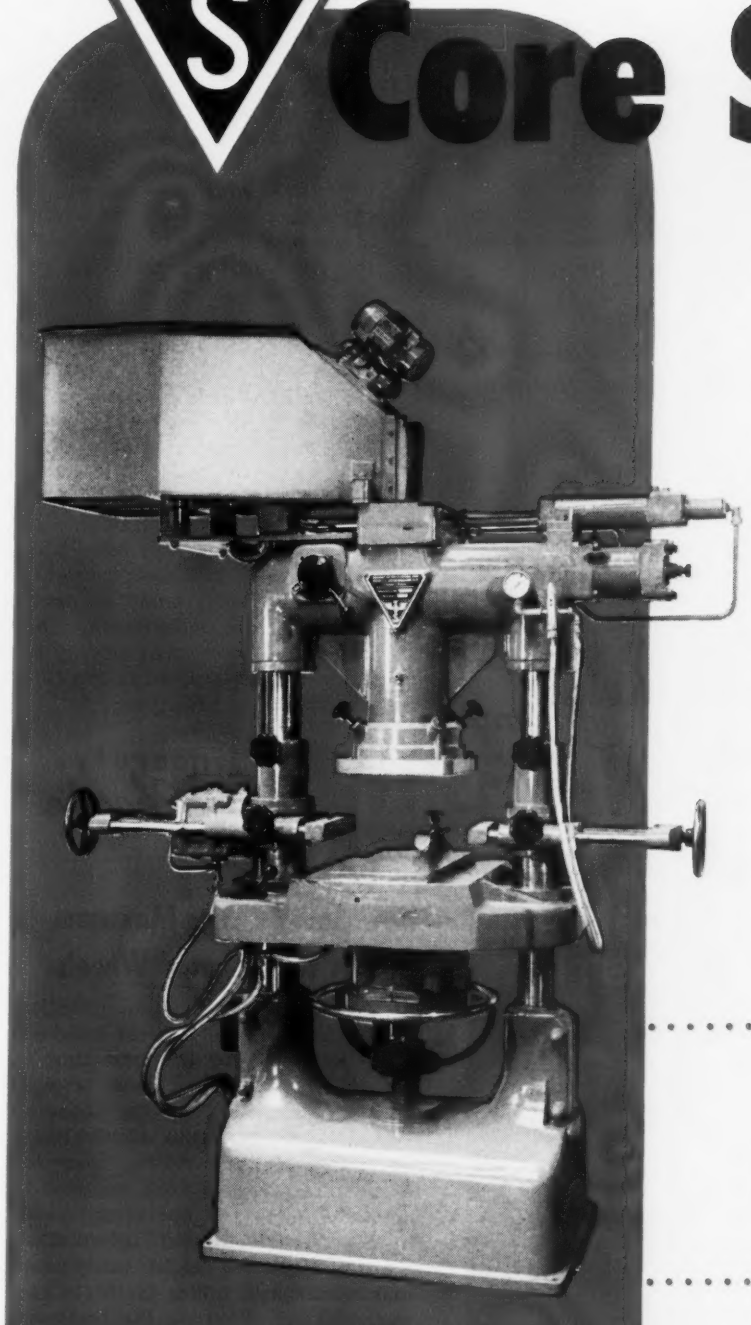

The V+S Core Shooter is available in 4 sizes of varying capacities. Shoot Heads can be furnished to accommodate all core boxes.

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Place half a KLEENEX tissue in the core box and shoot it in the V + S Core Shooter. The Kleenex will not be damaged. A regular core blower will tear it to bits.

Ideal for CO_2 Process with STEINEX because hardening in shoot holes and shoot heads is eliminated.

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parting is dusted on the pattern, a little sand riddled on and the flask is filled level. Peen completely around the pattern between pattern and sand strip, jolt, fill and squeeze. Sand in the drag should be level with the flask edge since no bottom boards are required or used. The drag simply is lifted off and set down. The cope is made in the same manner, except that riser and sprue are cut.

Next, core up the drag, put on the cope and weight or clamp it. Since you have a gate, a riser button and a sprue button in both the cope and the drag, those in the drag are not used and fall on the opposite side of the center line from those in the cope. A box can be made to make a dry sand core to stop off the ingate in the drag if you choose.

If you have the pouring capacity, one man can make up the required 75 castings with the 3-in. IDs in the morning, change prints at noon and run up the 2½-in. IDs in the afternoon. Just keep him poured off and shaken out. If metal frequency is not fast enough, make up more flasks to increase mold storage between metal. Money spent on rigging is well spent 90 per cent of the time and the return is gratifying.

Sincerely,
Charlie

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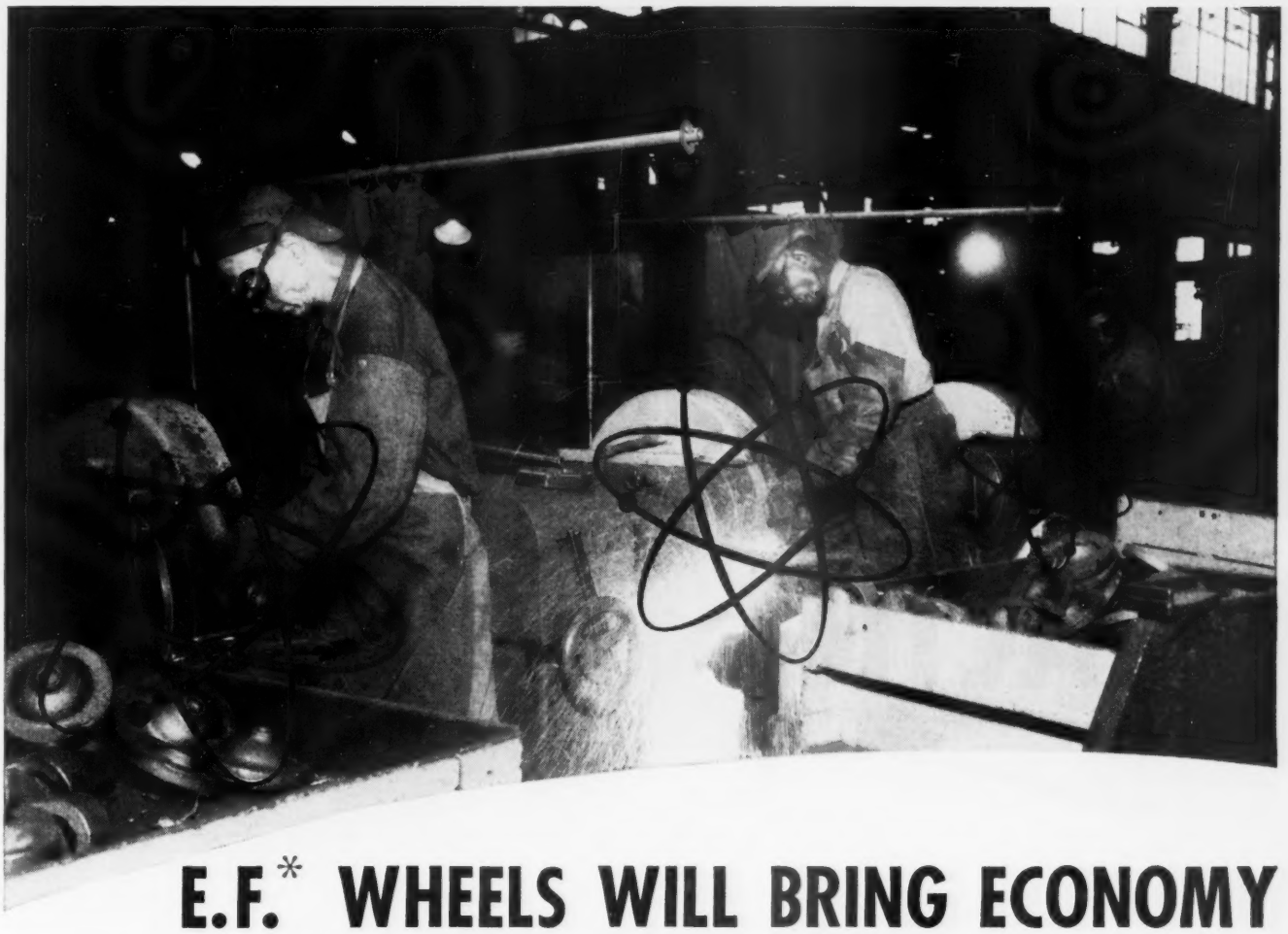
New Booklet Lists Maximum Speeds for Mounted Wheels

Information on maximum operating speeds for mounted wheels has been made available for the first time in "Mounted Wheels," a new 36-page booklet just issued by the Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15. Heretofore, operators of mounted wheels were required to compute maximum operating speeds by using "critical speed" information.

In the booklet, eight easily used maximum-speed tables facilitate correct use and eliminate the confusion which occurred previously when other than safe maximum operating speeds were listed. The booklet contains rules for safe and efficient operation and information on standard sizes of mounted wheels, together with standard mandrel sizes applicable for each. Three pages of silhouette drawings show the popular standard sizes of mounted wheels.

A new suffix designation system, designed to simplify ordering mounted wheels with standard mandrels, has been incorporated in the publication. Copies of the booklet are available, without charge, from the Grinding Wheel Institute.



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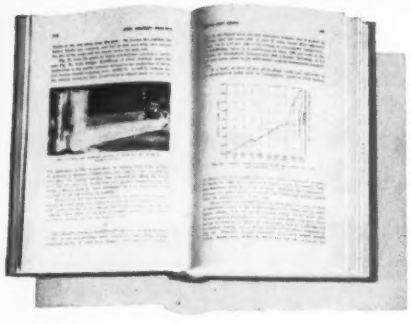
By JOHN HOWE HALL



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This volume represents the last of the many contributions which the late John Howe Hall made to the progress of the foundry industry. Material presented in this book began as a series of articles in FOUNDRY magazine.

Steel foundry personnel (from top executives to apprentices), educational institutions, technical libraries, suppliers to the steel foundry industry . . . all will benefit from the use of this book.

A complete cross index permits ready reference to any section. Many references relating to additional sources of information are provided. Use the coupon at the bottom of this page to order your copies now.

ABOUT THE AUTHOR

The late John Howe Hall was associated with the production of steel castings for nearly 50 years. Mr. Hall received his bachelor's and master's degrees from Harvard University. He was employed by Bethlehem Steel Co. and Buffalo Crucible Castings Co. until 1906, when he joined Taylor-Wharton Iron & Steel Co. He remained there until 1937, when he became a consulting metallurgist. His previous major work was The Steel Foundry, *published in 1914, with a second edition in 1922.*

Mr. Hall was the author of many papers presented before the American Society for Testing Materials, the American Foundrymen's Society, the American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers. In 1924, he received the first Whiting Medal awarded by the AFS.

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Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"The Peddler"

MY early years were spent in a Northern California mining town, a community which in 1850 boasted of having cast the second largest vote in the state. By the time of my arrival, however, its gold deposits were exhausted, and it had been reduced to the status of a ghost town. Its one dubious claim to distinction lay in the fact that it had been named after a horse-thief, "Yankee Jim," whose end was as ignominious as that of the town itself.

Because we were remote from railroad, telephone and telegraph, news of the outside world reached us only after it had ceased to be news. With the coming of spring, however, we always had a welcome visitor, "Little Jimmie," a peddler who proved to be a forerunner of the later five-and-dime store.

Tramping over miles of mountain roads, he carried on his aged shoulders a huge pack of miscellaneous merchandise difficult to describe. From baby nipples, safety pins, ribbons and calico cloth to bandanna handkerchiefs and neckties, Little Jimmie seemed to have anticipated the varied needs of these backwoods people. As a purveyor of consumer goods, he was welcomed probably as no peddler ever has been welcomed before or since.

At every house and cabin, the best chair was dusted off for him, food and drink were temptingly brought forward, and folks seemed to vie with each other to do him honor. They spent their money freely, buying things they didn't really need, just for the privilege of hearing him talk. The sale of knickknacks provided him with bread, but his conversation was the priceless ingredient of his popularity.

Jimmie brought us news of the outside world. He told us how people there were living, what they were doing and how, of their successes and failures and especially of all the new things invented to make life easier and happier. We listened in incredulous wonder, yet we never doubted that Little Jimmie was just about the best informed man alive!

I was reminded recently of my old friend when I heard a salesman of foundry supplies refer to himself as a "peddler." There surely was a wide gulf between my itinerant, who plodded along mountain roads, and this nattily-dressed, Cadillac-minded agent for core oil and molding machines. While they differed in matters of clothes, conveyance and conversation, the fundamental object was the same with each: There was a living to earn, and each was striving to keep it well above the subsistence level.

I've always felt that there was something undignified in the word "peddler," just as there is in hawker or huckster. Yet, whether you call them salesmen, agents, factory representatives, hucksters, vendors or peddlers, the fact remains that they perform a very necessary function in this rather complex society. They become the very heralds of the free-enterprise system, and they proudly trumpet the news of every economic advance. At times, of course, most

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MABCO FASTDRY Core Paste is semi-liquid and ready to use.

Like its counter-part, MABCO REDDY Core Paste, it may be dispensed with a barrel pump or a 2" molasses gate.

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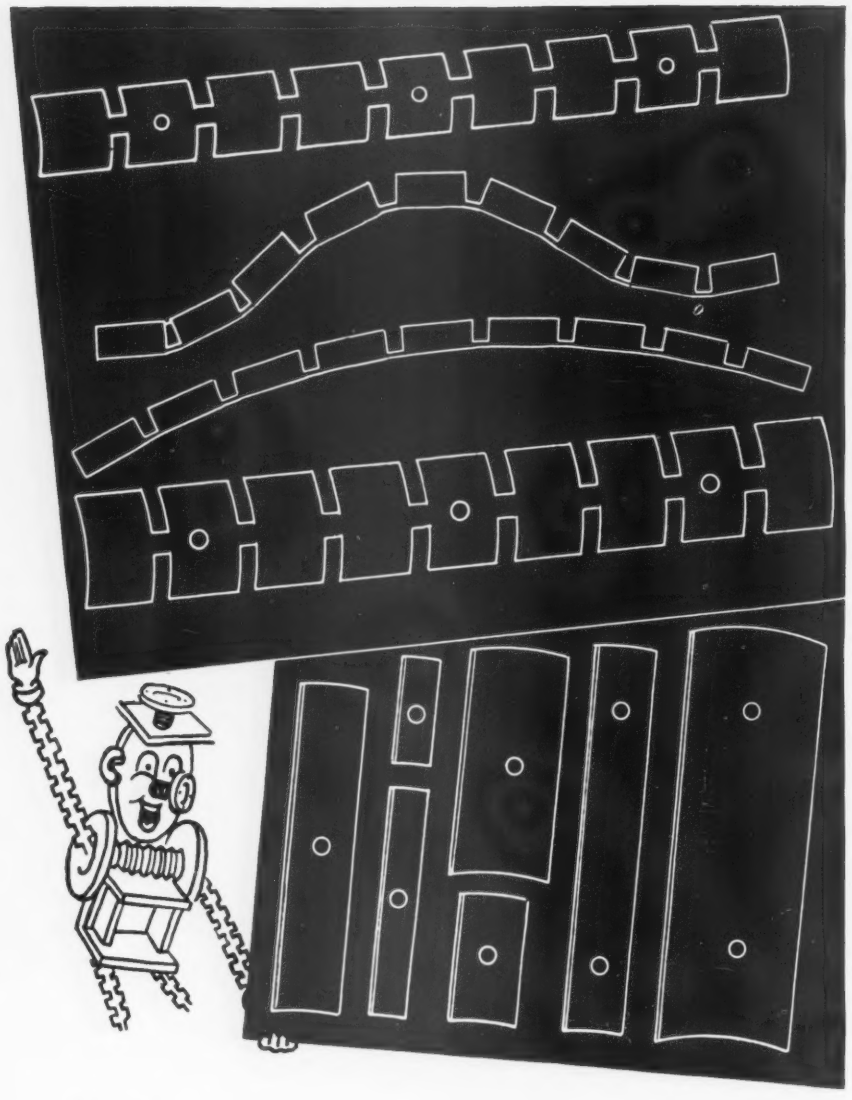


of us look upon them as a damned nuisance, especially when they interrupt us in matters presumably more important.

For many years I secretly have envied and admired the successful salesman. This feeling is due partly to the fact that on at least three occasions I experienced the minor tragedy of personal failure in the selling field. More recently, however, my sojourn in Turkey proved an indelible reminder of the importance of the foundry supplier—that boy with the briefcase who calls himself a "peddler."

As far as I was able to learn, in the entire territory of Asia Minor, there is no such thing as a foundry supply house and certainly no salesmen of such goods. Most Turkish foundries are government owned, each with a manager who must requisition his supplies weeks and in some cases months in advance, from other departments of the government. These supplies must be transported by government railroad, when and if more pressing cargoes have been attended to.

It is not unusual for the Turkish foundryman to find himself without coke or metal. There just is no such thing as being able to telephone for a delivery tomorrow, or even next week. He simply must do the best he can, developing a patience superior to that of our Biblical Job, and if at times he becomes wearied of delay and then apathetic—well, who can blame him?

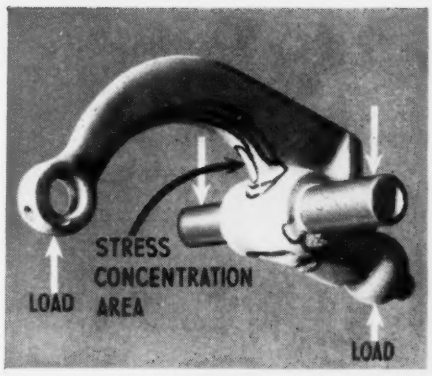
As of this writing, government ownership in Turkey leaves much to be desired. While the government there makes the best and cheapest *beer* I have ever tasted, in other respects, the system has not proved exactly a blessing. This is especially true of the foundry, and no one appreciates it better or deplores it more than the Turkish foundryman.

He is expected to make good castings without benefit of suitable sand, iron, coke or equipment. He is completely denied core oil and resin, cornflour, woodflour, pitch compound and many other things which elsewhere are considered essential to good foundry practice. American bentonite is looked upon as sheer luxury. When obtainable, it is kept under lock and key, figuratively speaking.

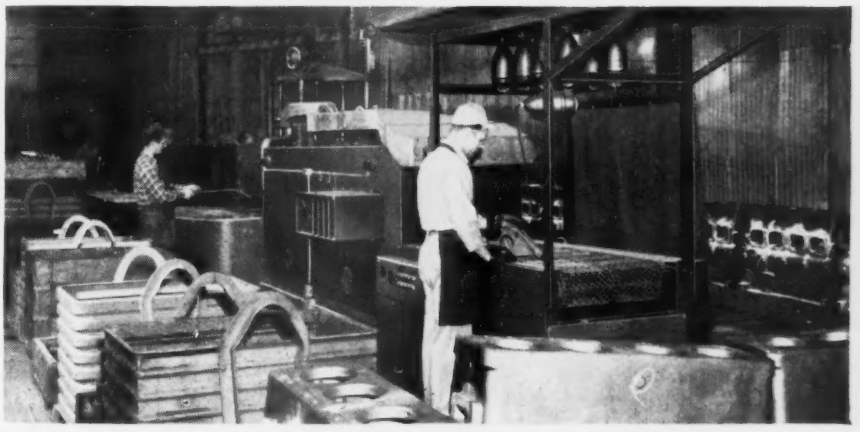
Of course, government restrictions, shipping costs and other economic factors are bound to darken the foundry picture in Turkey for some time to come. But I can't help wondering what miracles will occur when a live American salesman appears on the scene and really starts to "talk turkey," foundry style.

When Marcus Aurelius—or per-

Case Studies:
NONDESTRUCTIVE TESTING SYSTEMS



STRESSCOAT IMPROVES CASTING DESIGN—This Magnaflux developed brittle lacquer coating is used for testing and measuring stress in working parts or designs. Stress analysis is providing new ways to reduce cost and weight of products to make them lighter, stronger and cheaper.



Custom testing installation for malleable castings.

New Methods Increase Profits and Expand the Market for Castings—Help Improve Foundry Practices

MAGNATEST SORTS CONTAMINATED CASTINGS by using their conductivity to measure purity. A small hand held coil induces eddy currents in parts which in turn registers on the dial. By observing changes in this current you can determine the degree of contamination. 10,000 red brass castings were recently sorted by this means at a rate of 500 per hour.

In today's economy, the profit-minded foundryman strives for consistent quality rather than perfection. This consistency pays off for both the foundryman and user.

Magnaflux offers a variety of nondestructive testing methods to aid you in achieving consistent quality in day-to-day foundry production. For instance, consistent quality starts with good casting design. M Stresscoat is invaluable for measuring stress and load concentrations, to develop designs for light, stronger and cheaper cast parts.

Magnaglo tests on pilot runs can indicate troublesome pouring or handling practices which may contribute to cracks and other defects in finished parts. With Magnaflux, Magnaglo or Zyglo methods all severe cracks in any metal can be found and evaluated. Thus, you eliminate scrapping of good castings for seemingly visible defects that have no bearing upon the true strength or service life of the casting. If serious defects do exist, proper corrective action can be taken before further costly processing. For any selected service level, M test systems permit you to set the standards and hold to them. After correct procedures have once been established, only a sampling "finger-on-the-pulse" inspection is required to insure consistent, reliable casting production. These are profitable steps to building acceptance and expanding marketing opportunities for cast parts.

For detailed information on M applications for your specific operation, call in one of our experienced Magnaflux engineers, or write today.

FOOLPROOF METHODS FOR LARGE OR SMALL CASTINGS

M offers a variety of fast, low cost, nondestructive methods for testing ferrous and non-ferrous castings of every size and shape from watch cases to valves or side frames. Whether you require a custom installation for steady production-line operation, or a portable unit for sampling tests in your production process, we can supply systems to meet your exact needs.

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haps it was some other Roman—said, "let the buyer beware," he was expressing what since has been suspected universally—namely, that the huckster is prone to exaggerate the virtues of his product. Honest merchandising unquestionably has suffered down through the years in the wake of the charlatan. Salesmanship, however, has since traveled far along the road of redemption.

Today our legitimate salesman not only must know his goods and stand squarely behind them, but he must be ready to provide a service (free) which often carries an intangible value surpassing that of the article for which he collected his commission. The degree of this service frequently marks the advantage of a man over his competitor. I have found this to be true of those who take orders for foundry materials and equipment. Although foundrymen are not entirely unappreciative of such service rendered, I doubt that they are fully aware of the debt they owe to these self-styled *peddlers* of foundry supplies.

In my own rather frustrated attempts to fathom the mystery of foundry sand behavior, I have learned to lean heavily upon the suppliers who pay me weekly visits. I find their conversation stimulating and thought provoking, and I rarely regret the time consumed in these visits. These men have learned by experience the danger involved in dispensing unasked advice too freely, with the likelihood of its being misinterpreted and hence misapplied. On the other hand, they know when "A word to the wise is sufficient," and they have saved dollars for many a foundryman by providing a simple formula in a crucial moment.

When I say that I envy the foundry supplier, I must qualify the statement—I don't envy him the innumerable disappointments and headaches which I suspect are a part of his job, but I do envy him the never ending opportunity to increase his knowledge of the foundry—with particular emphasis on *sand*—without even getting his hands dirty.

He probably visits from three to five foundries during each of his working days. I would hazard the guess that he meets at least one foundryman each day who is having sand trouble and is not ashamed to admit it. If this man knew exactly what was wrong with his sand, he would speedily and quietly correct the situation, without confessing his trouble to a salesman or anyone else.

But when a man gets into sand trouble, and his imagined remedies fail at the outset, or even aggravate the problem, he becomes to some extent blinded by his own frustration.

Unload 2 tons with 1 hand

It's easy with a Roura Self-Dumping Hopper. Simple, one-man operation does it with amazing speed . . . *cuts cost of hand unloading by at least 50%*. That's why hundreds of leading industries have found it the safe, sensible, economical way to handle wet or dry, hot or cold bulky materials.

It fits securely on any standard fork or platform lift truck . . . turns it into an efficient, semi-automatic dump truck. And, remember . . . Roura makes 'em rugged . . . extra heavy gauge welded construction . . . to withstand years of toughest treatment. They're available in sizes from ½ to 2 cubic yards.

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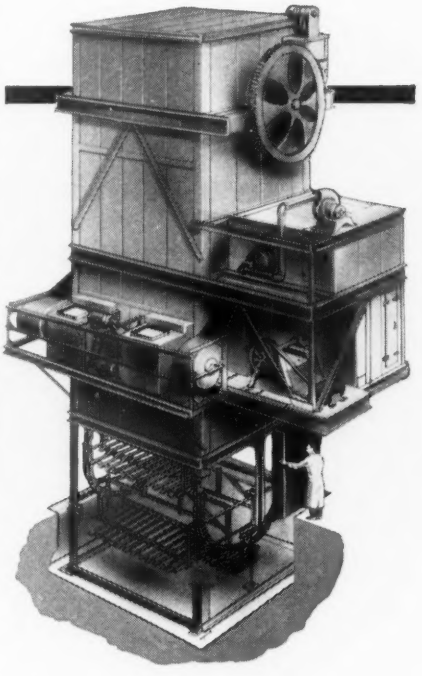
HOW MUCH DOES A FOUNDRY OVEN COST?



We could tell you down to the penny what the conveyor core oven pictured above cost. But that wouldn't really be the answer you would want.

Because the real cost of any oven comes *after* it's been installed. *After* you find out how much fuel it consumes; how many rejects pile up; how much production you get. That's the answer!

And that's the answer you *will* get—before the oven is installed—when experienced MOCO engineers specifically design an oven for your application. It will be the most economical piece of equipment possible. Why not contact MOCO today?

SEND TODAY for this free brochure explaining MOCO Foundry Ovens and their operation.

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There's BIG NEWS in Resin Coated Sand

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- ***FASTER PRODUCTION***
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This man is engrossed in the story of Durez sand coating resins and the results now possible for the first time in easier, faster and more economical mass-production of shell molds and cores with coated sand—either dumped or blown.

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JISCO *noun*. the Silvery Iron produced by Jackson Iron & Steel Company, Jackson, Ohio. A quality iron with no detrimental tramp elements. Cast in Pigmie size (10 pounds) pigs, for easy handling and proper distribution through charge. Extremely low in sulphur, phosphorous under .15%, with manganese 1% to 2%. Available for foundries interested in producing quality castings economically.

silvery *adj.* a pig iron with 6% to 12% silicon. Valuable as source for Iron (Fe) plus Silicon (Si) in melting units such as cupola, air furnace, open hearth, and in electric furnaces for recarborizing.

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Established 1890

Like the proverbial drowning man, he cries for help and welcomes any hand that may be offered. Surprisingly often, our boy with the briefcase has the precise information which can save the day!

This briefcase of the foundry supplier contains a wealth of material relating to products and prices, technical advice, shipping dates and procedure, etc., but tucked away in a retentive and elastic memory, he has much more factual data available, of even greater importance than that in his leather bag.

In his daily rounds, he is exposed not only to a detailed recital of every imaginable type of sand-failure, but also to the many measures resorted to in the endeavor to effect a cure. He soon learns which remedies were successful and which were not, and often without mentioning names or violating a confidence, he quickly solves a problem.

The average foundryman has a tendency to confine himself and his thinking to his own shop. The practice is not altogether to be condemned, but it does narrow vision and retard industrial growth, and he finds himself unable to benefit fully from the reading of his technical reports. He requires the spoken word and the contact provided by his genial supplier, the "peddler."

Celebrates 10th Anniversary

Engineered Precision Casting Co., Matawan, N. J., this year will celebrate its tenth anniversary as a producer of investment castings. Founded by Walter A. Dubovick and Alexander Grant, who today are president and vice president, respectively, the company now has 70 employees. It is a charter member of the Investment Casting Institute, and Mr. Dubovick is head of the institute's process materials standards committee.

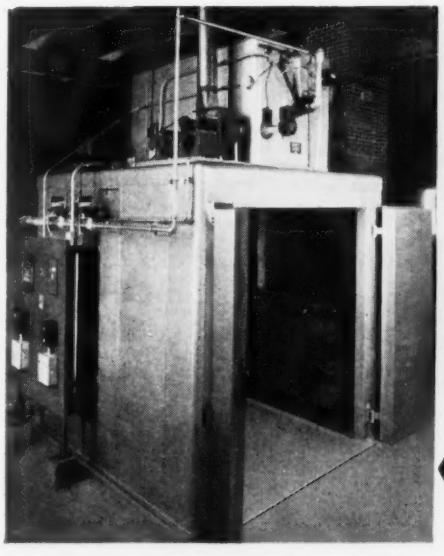
"He hasn't made a move since I accidentally spilled that new core binder on him."

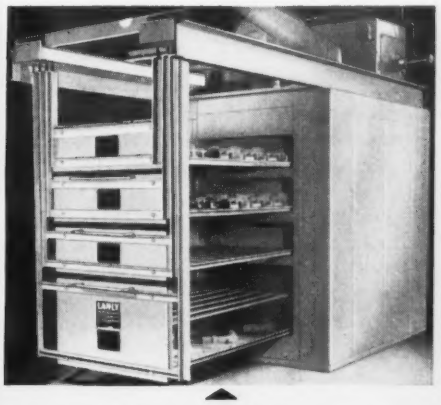
IS THE HEAVY HAND of OBSOLESCENCE *Retarding Your Production*

OLD STYLE, INEFFICIENT CORE OVENS

with antiquated hand firing and charging methods can add appreciably to your operating costs.

Then too, there is the problem of a high percentage of rejects in old oven production. Can you afford this?





1. Drawer Type Oven
2. Single Compartment Rack Type Oven
3. Car Type Oven

Isn't this an opportune time to examine closely the oven facilities of your foundry for a possible improvement? The average foundry requirements can be met with standard LANLY units. Custom designed units for core baking, pasting and mold drying are part of LANLY'S services, as well as ovens for casting conditioning and heat treating.

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Cleveland CHAPLETS

● Cleveland Chaplets provide you positive core support with the convenience of uniform stem and plates to speed molding. You'll find that their improved break-off design also reduces handwork to speed cleaning. You'll like the convenience of Cleveland service, too!

Delivery without delay!

PRECISE CORE SUPPORT

Sand packs tight through open coil for rigid support in mold.

OPEN COIL HEAD RADIATOR

DIMENSIONALLY UNIFORM

Uniform stems simplify molding, prevent annoying sand break-outs.

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EVENLY TINNED for CONTROLLED FUSION

Even tinning over clean metal gives uniform fusion for core support during critical stage.

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Supervisor Is Man with Ability To Get Job Done

His Function Is To Make Team of His Department

By John Morton*

THE word "supervision" often has been defined as applying to people who have super or above-normal power to envision—to see or plan. This aspect of supervision makes up only about 10 per cent of a supervisor's duties. It is the area in which he is able to project his experience and ability and thereby decide what is to come next. His ability to get things done comprises the other 90 per cent of his job. His tools for the task are, of course, the people who work under him.

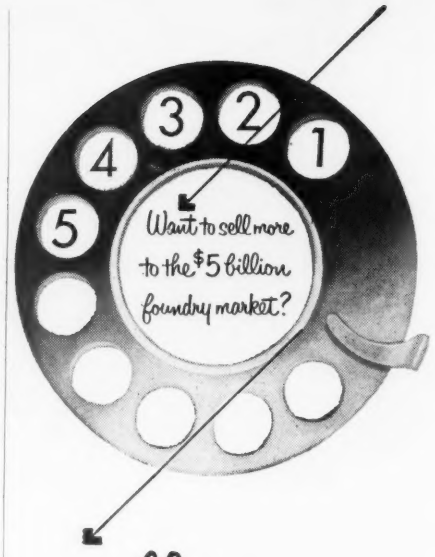
Ordinarily, a man can be trained to do a job in any amount of time from a few hours upward, but it usually requires years to produce a successful supervisor. To be a good leader, he must have acquired a skill in human relations. Employees must be ready to follow him willingly and with confidence; they must have a sense of being needed and appreciated, of having a place in the complex production pattern. Where this need is gratified and the other conditions of work are good, supervision can realize maximum efficiency. When employees are driven or are subjected to blundering leadership, efficiency falls.

It Takes Practice—Good supervisors are developed, not born. They must acquire an ability to grasp and retain the essential of job knowledge. They must be able to chart and direct the proper way to approach a task. Most of all, they need the ability to mold their people into a willing team able to complete a job properly, on time and at minimum cost.

Many factors go into the making of a successful supervisor. He must know when to say no to an employee and how to do it. He must avoid being too much of an extrovert—otherwise his preoccupation with his own importance will shove small details and human relationships into the background. And a supervisor's strength lies in the teamwork and personal accomplishment of all employees under him. Friends and cooperation are won more effectively by a mild introvert—but not by a person with an inferiority complex.

A supervisor must base his decisions on facts. An unpleasant part of his duties is to issue warnings for

*Foundry superintendent, Saco-Lowell Shops, Biddeford, Me.



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to put extra push behind your sales program

What is PLUS 5? It's your key to more business from foundries. It gives every FOUNDRY advertiser a bonus he can get from no other source. Here is help in analyzing this market—studying sales territories and potentials—planning the sales effort—and creating a constructive promotion program to the 5 billion dollar foundry market. It's time to take a new look at this market—and at the unusual selling aids we have for you. Say PLUS 5 to your FOUNDRY representative and he'll show you this 5-step program designed to move more of your products into foundries.

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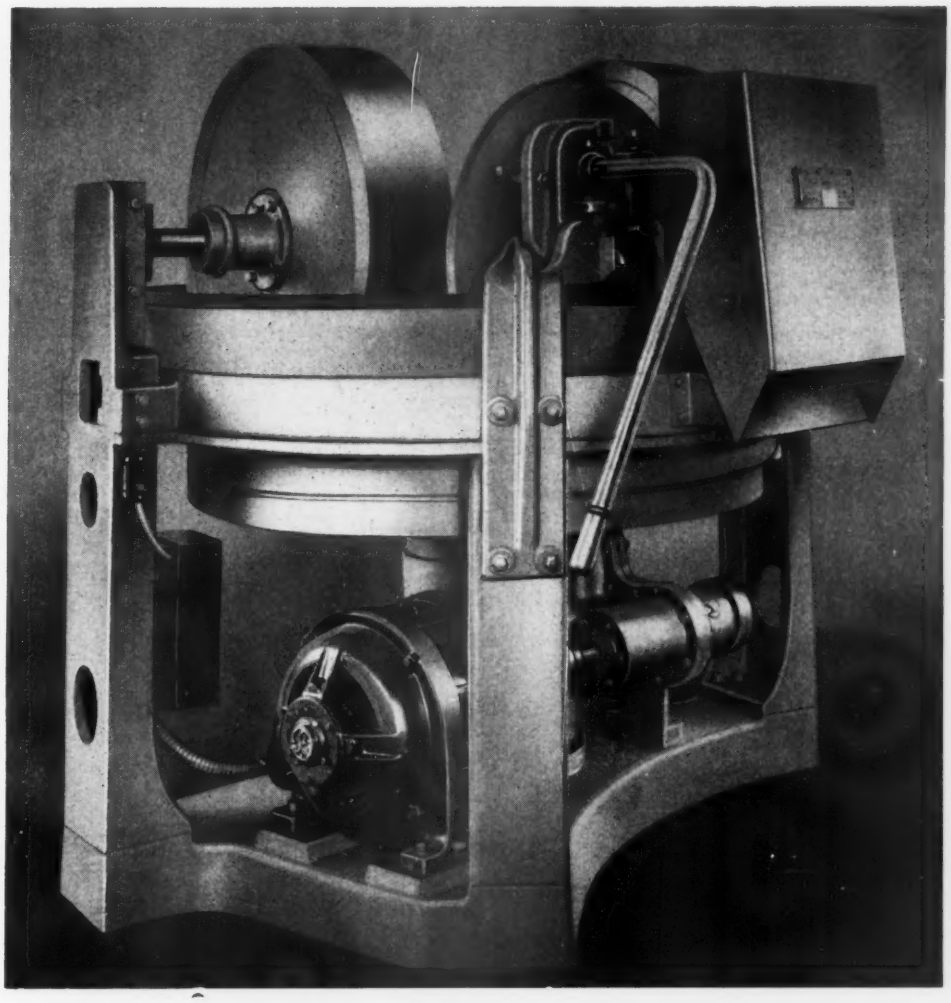
the *Clearfield Mixer*

takes guesswork out of sand conditioning



Quality control in sand preparation begins with the mixing equipment. Clearfield Mixers are engineered and built to give high quality results. Operating on the unique revolving pan principle and fully automatic controls, they assure you of high quality, properly mixed foundry sand. As one of our customers wrote: "Clearfield Mixers are perfect in every respect." You will agree—once you've checked.

Write today for Catalog No. 83. Clearfield Mixers are available in many sizes, for all requirements.

CLEARFIELD MIXER
mixes, tempers, aerates

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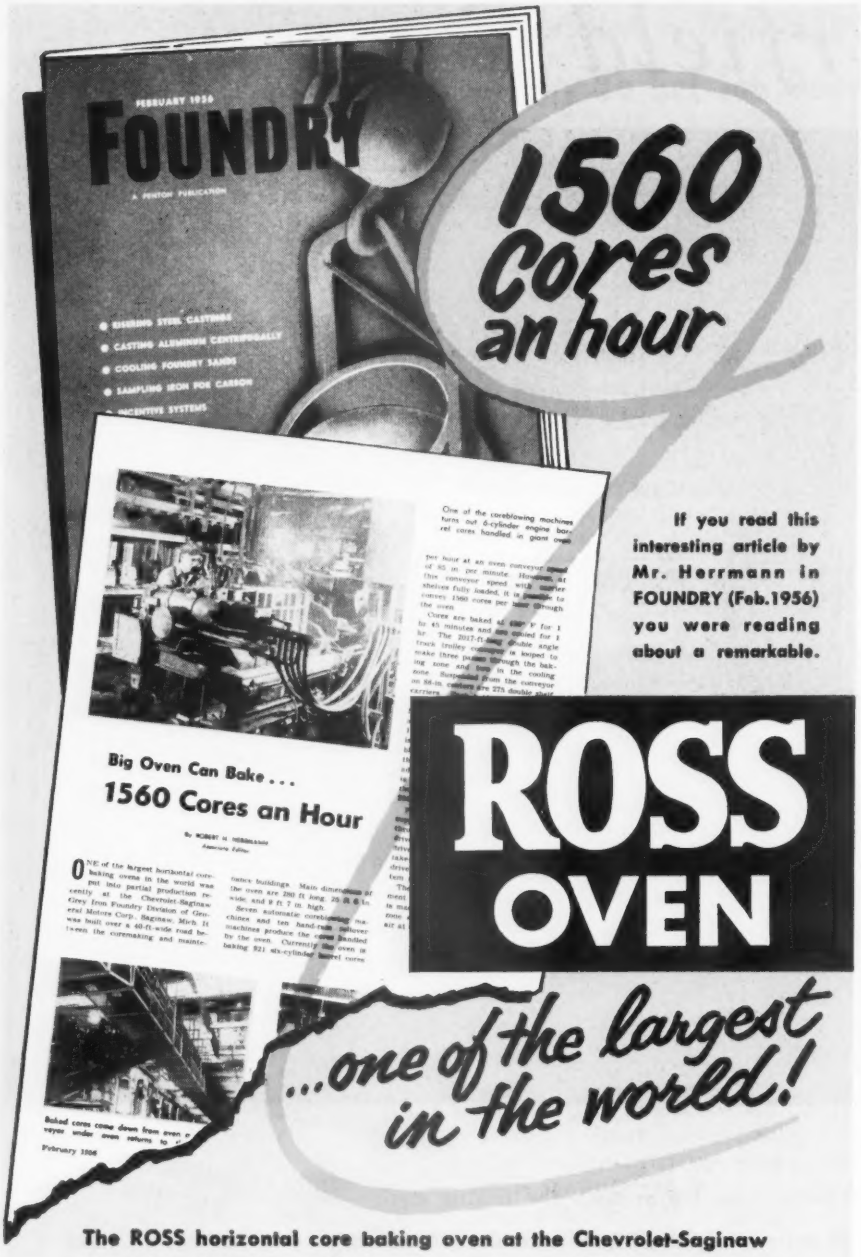
Clearfield Mixers manufactured in England by Hepburn Conveyor Co., Ltd., Wakefield, England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1560 cores an hour
If you read this interesting article by Mr. Herrmann in FOUNDRY (Feb. 1956) you were reading about a remarkable.
Big Oven Can Bake . . .
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ROSS OVEN
...one of the largest in the world!

The ROSS horizontal core baking oven at the Chevrolet-Saginaw Grey Iron Foundry, Saginaw, Mich. measures 280 ft. in length. With its conveyor speed of 95' per minute, this ROSS oven is capable of baking 1,560 six-cylinder barrel cores per hour—a remarkable production achievement. Recirculating heating equipment is gas or oil fired and cooling apparatus is provided.

For the most modern in mechanized core baking equipment, we invite you to write for our Bulletin No. 52.

Inquire about the ROSS Hot Blast Heating System that greatly increases tonnage while saving coke, labor and repairs. Can be installed with no interference with melting schedules.

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repeated failures to conform to company policy, for example. When a violation is discovered, however, he must be certain he knows why the incident occurred. If he acts on snap judgment, he may have to retreat by correcting an error, thus lessening the confidence of employees in his leadership. He should survey such possible causes of trouble as sickness, death, personal problems, machinery breakdowns, poor tooling, etc., before he acts.

Teamwork Important—A good supervisor should be willing to co-operate with other members of supervision and should be able to elicit the same kind of aid from them. If co-operation is refused him, he should not try to demonstrate his independence by proceeding alone. If patience fails to do the job, he might analyze himself to determine whether or not a conflict of personalities is involved.

As a leader, a supervisor must be ready to make his own decisions and to be responsible for them. He cannot properly rely on someone else to tell him he is right. He will thus become a better supervisor, even though he may occasionally be wrong. The man who makes excuses for the consequences of his decisions and actions is not a leader. He is a follower.

One of the most difficult problems faced by supervisors concerns obvious errors made by other members of supervision. Ignoring the situation weakens the other person and organization, but informing higher management creates resentment and suspicion. Telling the individual concerned is scarcely any less likely to create resentment.

A Meeting of Minds—Perhaps the only solution to this problem lies in daily or weekly meetings of supervision at which the end product itself is analyzed. A step-by-step analysis of an inanimate object may

"If you won't move for my sake think of how much SAND there is in Florida!"

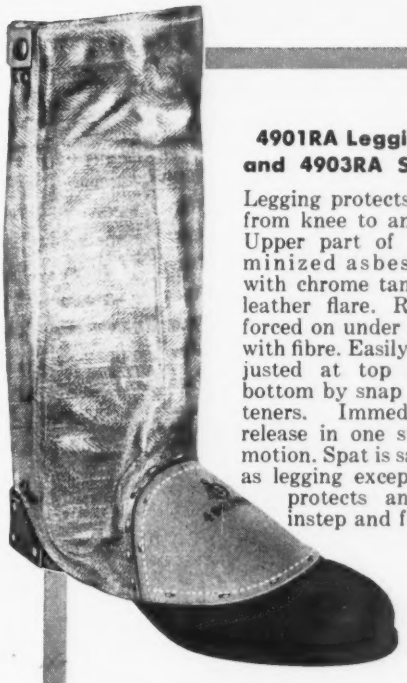
Foot and Leg Protection

For Foundry Feet "Running a Temperature"

AO Aluminized Spats and Leggings!

Reflect 90% of Radiant Heat

Here's the foot protection you want for cupola and ladle pouring . . . open hearth, blast furnace and electric furnace tapping and other exposures to high heat. Your workers get greatest comfort *2 ways* with AO Aluminized Asbestos: (1) 90% of the heat is reflected (2) Garment weight is reduced 50%. You are sure to find the exact spat and legging you want in AO's wide line. Your nearest Safety Products Representative can supply you.



4901RA Legging and 4903RA Spat

Legging protects leg from knee to ankle. Upper part of aluminized asbestos with chrome tanned leather flare. Reinforced on under side with fibre. Easily adjusted at top and bottom by snap fasteners. Immediate release in one swift motion. Spat is same as legging except it protects ankle, instep and foot.

1481RA Spring Type Legging

Very popular because no adjustments are necessary. Easy on, easy off! Spring steel frame not only helps protect leg from impact but creates air space between leg and legging. Has chrome tanned leather flare with spring clip.

7X160RA Legging and 7X161RA Spat

Legging is preferred by many because of unusual design and features. Has spring clip on chrome tanned flare. 3 positions at top and 2 at ankle for steel stay permit snug fit and quick release. Upper part of aluminized asbestos. Spat is same as legging except it protects ankle, instep and foot.

1481RAR Renewable Spring Type Legging

Same as 1481RA Legging except parts are replaceable. Covering (attached to frame by snap fasteners) can be removed and replaced. If damaged, either frame or covering can be ordered separately.

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

AIRengineering at work

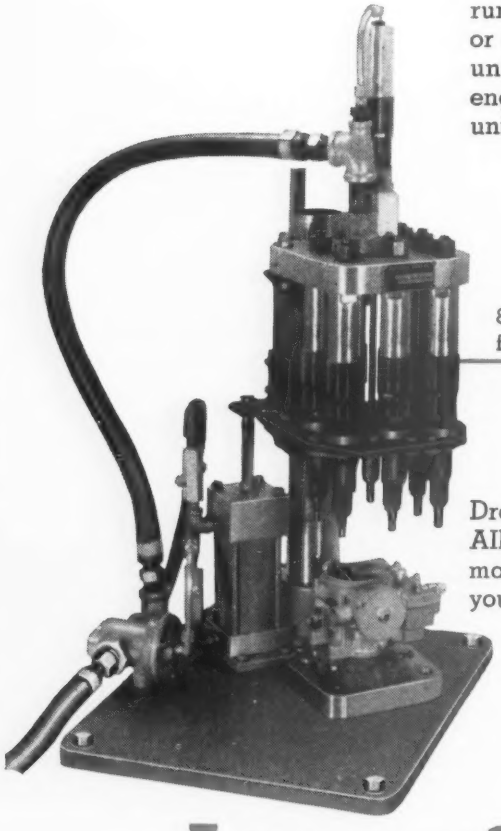
REPORT No. 5098B-3

Multiple Screw Driver assembles 400 carburetors per hour

Assembling carburetors was a slow, one-screw-at-a-time operation until AIR engineering solved the bottleneck. Now one operator uses this 8-spindle automatic Multiple Screw Driver to help turn out more than 6 completed carburetors per minute—400 every hour.

This compact, easy-to-operate Multiple Screw Driver is just one more example of how AIR engineering is helping modern industry solve problems and cut production time and costs.

All the experience of Ingersoll-Rand in speeding up fastening through AIR engineering multiple units is yours for the asking. Whether your operations involve screw-driving or nut running with either hand-held or automatic production line units, Ingersoll-Rand can engineer and build just the unit best suited to your needs.



8-Spindle Multiple Screw Driver for carburetor assembly.

Drop us a line if you'd like an AIR engineer to analyze and make recommendations on your fastening operations.

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

8-341

avoid the problems which would be caused by criticism of an individual, yet clear up the difficulty involved. The problem becomes an analysis of right and wrong, not a personal entanglement.

Mankind's social progress should stay abreast of its technological developments. As the rate of production increases, the higher level should benefit every person who participates in the system. Supervision has not been adequately informed and does not adequately understand that the so-called "stepup" in production is not directed at the well being of employees. On the contrary, increased production by employees means that they and their descendants can have more for less in their own living. Good supervisors strive for the teamwork that will help us to achieve that good for everyone.

Institute of Metals Meets And Elects New Officers

The Institute of Metals met in London Apr. 10-13 to conduct its annual general meeting and to elect new officers for 1956-57. Dr. Maurice Cook, retiring president, opened the meeting and announced that membership had risen from 4435 to 4647 during the preceding year.

Major C. J. P. Ball, chairman, Magnesium Elektron Ltd., is the new president of the institute. New vice presidents are Dr. N. P. Inglis, research director, metals division, Imperial Chemical Industries Ltd., and Dr. Ivor Jenkins, chief metallurgist, research laboratories, General Electric Ltd.

Members of the council include G. L. Bailey, director, British Non-Ferrous Metals Research Association; J. W. Berry, joint managing director, Birmingham Aluminum Castings Co.; G. E. Dono, director, sheet metal division, Nuffield Organization; Dr. H. M. Finniston, head, metallurgy division, Atomic Energy Research Establishment; Prof. Hugh Ford, department of applied mechanics, Imperial College of Science and Technology, University of London; and C. H. M. Holden, managing director, Hall St. Metal Rolling Co.

After he had been installed as president, Maj. Ball announced and presented the following institute medals: The Institute of Metals Medal in Platinum for 1956, Prof. Georges Chaudron of the Sorbonne, director of the Vitry Laboratory, Centre National de la Recherche Scientifique; the Rosenhain Medal for 1956, Dr. Donald McLean, principal scientific officer, metallurgy di-

vision, National Physical Laboratory; and the W. H. A. Robertson Medal for 1955, with a premium of 50 guineas, E. J. Thackwell, Northern Aluminum Co.

Maj. Ball also presented the prizes for student essays and delivered his presidential address on "The History of Magnesium."

Technical sessions included papers and symposiums on materials for nuclear power engineering, final forming and shaping of wrought nonferrous metals, powder metallurgy, embrittlement and fracture, rolling textures and recrystallization, and alloy thermodynamics.

At a special session arranged by the Metal Physics Committee, Prof. Dr. E. Schmid, University of Vienna, delivered a lecture on "Electron Emission from Metals." Other special features included an informal discussion and exhibition of materials employed in nuclear energy engineering and the annual dinner, which was attended by more than 400 members and their guests.

It was announced that the autumn meeting of the institute will take place at Stuttgart, Germany, by invitation of the Deutsche Gesellschaft fur Metallkunde, Sept. 17-23, with two further days at Frankfurt, Sept. 24-25. Many works visits will be organized.

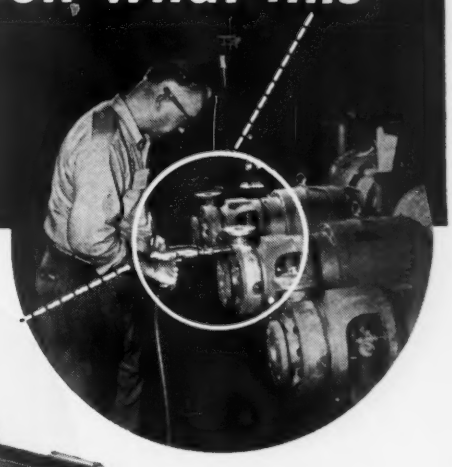
Government Booklet Describes How To Repair Wooden Pallets

A report on the most economical methods of repairing wooden pallets used in material handling has been released to industry through the Office of Technical Services, U. S. Department of Commerce.

Prepared by the Navy, the report includes information on the 48 x 72-in. stevedore pallet, the 48 x 48-in. pallet and the 40 x 48-in. pallet, both block and four-stringer types. Examples of types of damage which cannot be repaired economically are illustrated. Also covered is a method of converting the 48 x 48-in. pallet to the 40 x 48-in. size for use with straddle-type fork trucks and methods of cutting the block type and the stringer type for adaptation to the straddle truck.

The report is PB 111755, Pallet Repair Manual, by H. A. Rother and M. Toscana, Naval Supply and Development Facility, Bayonne, N. J. It contains 34 pages and may be ordered from OTS, U. S. Department of Commerce, Washington 25. Price is $1.

Have you seen what this CAN DO FOR YOU?



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NEW accuracy and speed for precision nut running jobs . . .

POSITIVE TORQUE CONTROL—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.

SIMPLE TORQUE SETTING—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.

TORQUE SETTING REMAINS CONSTANT—for any nut running condition until the adjustment is changed.

ELIMINATES "OVER-TORQUE"—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.

LOW MAINTENANCE—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.

REVERSIBLE—full power in either direction.

NO CLUTCH—to wear, slip or require adjustments.

* 2 TORSION BARS PROVIDE MULTIPLE TORQUE SETTINGS

No. L735 Max. torque 60 ft. lbs.

No. H735 Max. torque 90 ft. lbs.

For torques up to 550 ft. lbs. a Size 5340T Torque Control Impactool is available.

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FOUNDRY RUBBER, INC.

Offers V-belt Drive Data

Allis-Chalmers Mfg. Co., Milwaukee 1, has published a booklet covering the origin, history and development of modern V-belt drives. Discussion of the evolution of standards in engineering V-belt drives, how to engineer such drives, tables, data, modifications, basic principles and practices are included. Copies of the booklet, "Modern Multiple V-belt Drives," are available for $1.

Leaflet Tells How a Sound Will May Save a Small Business

A sound will may avoid forced liquidation of a small concern, eliminate many management problems and help to perpetuate the business, according to a new leaflet published by the Small Business Administration. The leaflet is No. 7 in the SBA's series of Marketers Aids and may be obtained on request from any of the agency's offices.

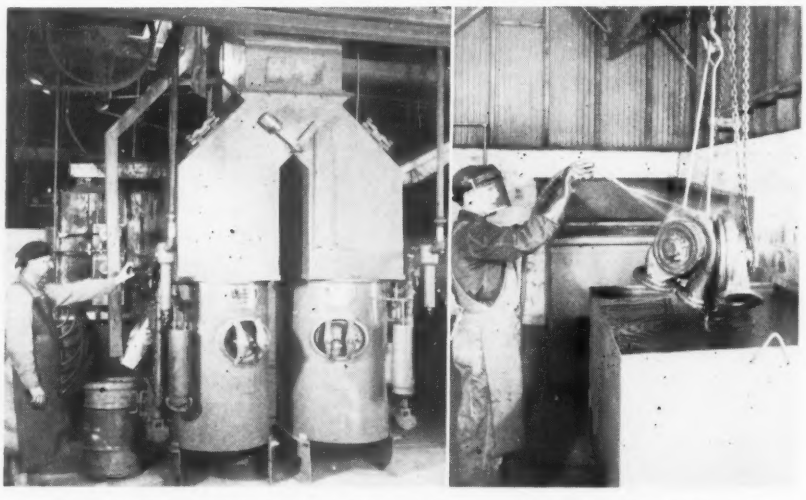
The leaflet points out that a small business owner should provide for his executors to carry out any arrangements made during his lifetime for the sale or other disposition of his business interests. Authority of the executors is discussed in the leaflet, and suggestions on the specific power that should be granted to executors in the will is given.

Book Review

Applied Automation, ed. by James Custer, cloth, 8½ x 11 in., 235 pages, published by Chilton Publications, Philadelphia. Price, $6.

With the aid of hundreds of photographs, this volume describes the continuing technological progress which has accelerated interest in the approach of the continuous, automatic production line. It covers over 100 specific applications, including operations in casting, machining, plating, welding, forging, printing, heat treating, resting, assembling, painting, inspecting, control systems, computers, riveting, stamping, scrap disposal and others.

Sand-Shot Machine Expedites Casting Cleaning



To expedite cleaning of stainless steel castings, Empire Steel Castings Inc., Reading, Pa., has installed a sand-shot blast machine with capacity to handle 13-14 tons daily and a pickling house that will handle an estimated 4-5 tons daily.

Blast machine is a double-unit model, with dust arrestor, capable of handling castings up to 2500 lb. Blast hose air pressure is maintained at 90 psi. The sand tower is used frequently for stainless castings. A lever cuts off the sand supply and switches the shot tower into operation for cleaning large carbon and alloy castings.

Used sand and shot are retrieved by dropping through a floor grating to a bucket elevator. Running on a conveyor belt, the buckets are carried from below floor level to the top of the tower through dust arrestor chambers. Compressed air cleans sand or shot as it passes through the chambers. It then falls to the proper storage tank for reuse.

Stainless castings are pickled in a new acid tank for refined cleaning of iron traces that may be picked up in the foundry. Castings are immersed in a solution of nitric, hydrochloric and hydrofluoric acid at a temperature of 120° F for 20 minutes, then rinsed in water to remove all acid.

For more information, use Reader Service Card, page 229

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FOUNDRY

The Shakeout

Zinc Die Castings Simplify Radio Antenna

THREE ZINC DIE CASTINGS provide efficient raising and lowering action for a new vacuum-driven automobile radio antenna produced by Pioneer Specialty Co., Detroit. The die castings are designed for use as a diverting valve to control the vacuum created by the engine manifold. Zinc is reported to have been chosen for its durability, corrosion resistance and economy in production.

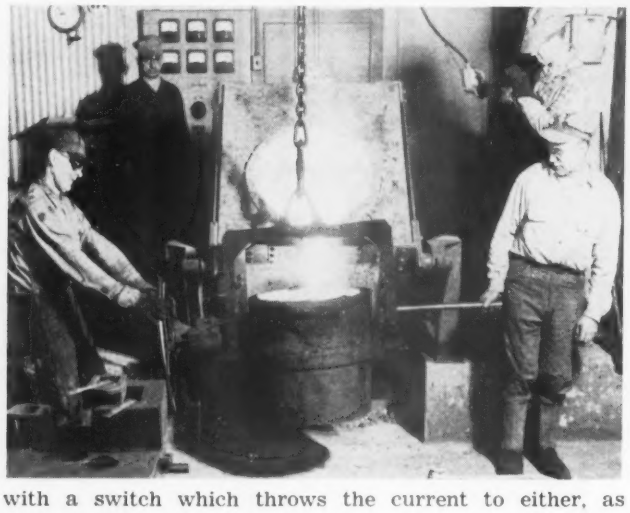
Use of die castings keeps construction of the valve down to three components. The cover, which could not be fabricated with a screw machine, requires only a lapping operation on the operating surface. The slide also requires no secondary operation other than lapping the operating surface. On the body, machining consists of drilling a $\frac{1}{16}$-in. hole in the side and tapping two cored screw sections.

For More Details Circle No. 598—Page 229

New Furnace Installation Aids Versatility

AS PART of its continuing modernization program, Empire Steel Castings Inc., Reading, Pa., has installed two new Ajax induction melting furnaces which will enable the foundry to increase its line of corrosion-resistant steel castings. The new equipment adds at least six additional grades to the company's line of stainless and permits it to offer over 35 different steel and alloy grades from the same pattern equipment.

Two separate melting units have been installed, one a 650-lb shell and the other 1000 lb. They are used singly,



with a switch which throws the current to either, as desired. Each shell is powered by the current from a motor generator, operating at a frequency of 960 cycles per second. The motor generator is totally enclosed. It and all capacitor banks are watercooled.

Temperature control is very accurate, but each heat is checked several times with an immersion thermocouple. No metal loss is said to occur. The electrical system is governed by a complete set of safety controls.

For More Details Circle No. 599—Page 229

Wheel Block Is Made of Cast Alloy Steel

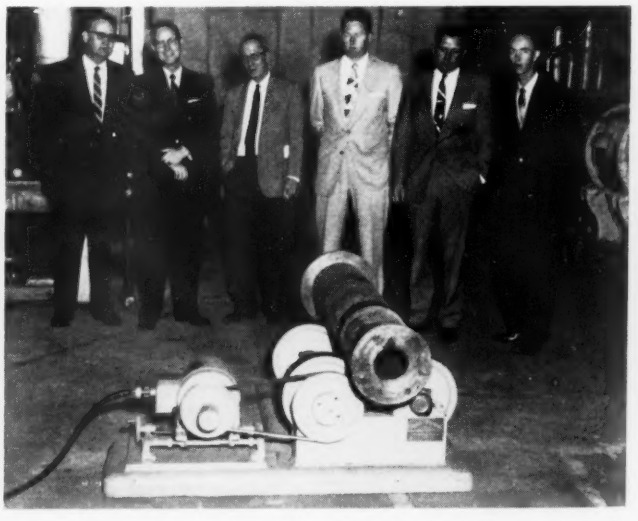
BY USE OF stress analysis and other engineering and manufacturing techniques, Calumet Steel Castings Corp., Hammond, Ind., produces a cast alloy steel wheel block adequate for use with heavily loaded vehicles. Designed with rounded edges, stiffening ribs and supporting members, as well as with integrally cast gripper teeth, the blocks are 9 x 10 x 10 in. and weigh 14 lb each.

They are available optionally with the owner's name cast on in raised letters when made up for specific orders. Fully heat treated, they are finished in yellow paint.

For More Details Circle No. 600—Page 229

University Gets Centrifugal Casting Machine

THE NEW centrifugal casting machine shown here was presented recently to the University of Alabama metallurgical engineering department by U. S. Pipe & Foundry Co., Birmingham. It will be used in the foundry laboratory



to demonstrate the centrifugal casting process to engineering students.

Left to right, looking over the new machine, are A. J. Fruchtl, until recently with W. Thomas Barr Associates, Birmingham, originator of the project; K. R. Daniels, vice president, American Cast Iron Pipe Co., Birmingham; E. C. Wright, head, metallurgical engineering department, University of Alabama; Charles Drake, foreman, U. S. Pipe & Foundry Co.; W. J. Estes, metallurgist, U. S. Pipe & Foundry Co.; and Gene A. Gorham, president, AFS student chapter, University of Alabama.

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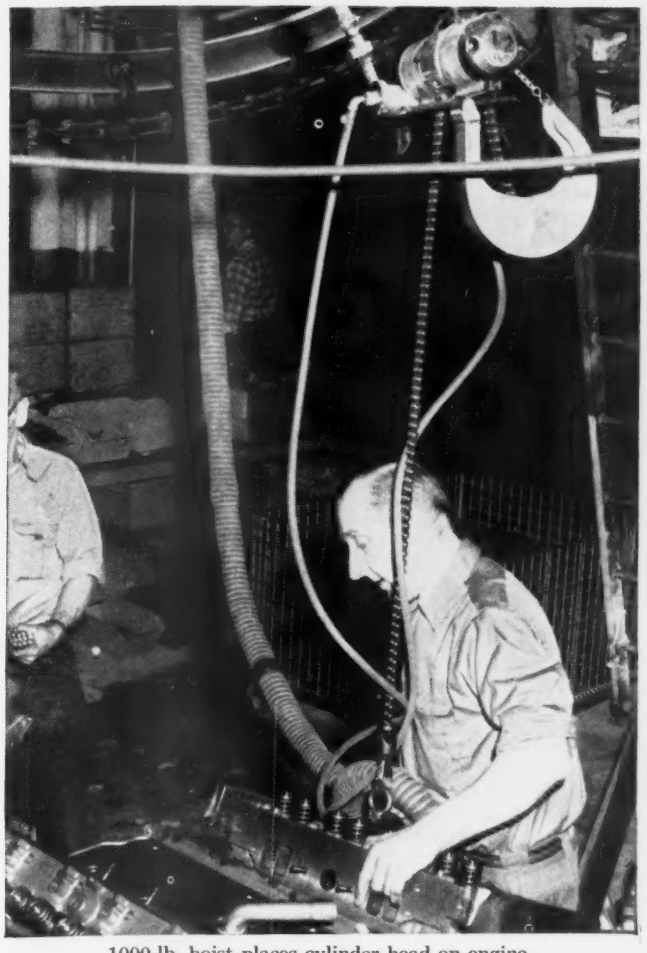

1000-lb. hoist places cylinder head on engine. No burned-out motors to stall production.

KELLER TOOL AIR HOISTS
make handling easy as it looks

Speed your handling jobs . . . in assembly, foundries, machine shops, shipping rooms — wherever dependable, controlled raising and lowering are needed.

CHECK THESE FEATURES BEFORE YOU BUY ANY HOIST

- **NO BURN-OUT** from overload or stalling.
- **LOW MAINTENANCE** — rugged piston-type motor unaffected by dust or fumes.
- **ECONOMICAL**—uses much less air than other hoists of same capacity.
- **CONTROLLED SPEED**—from creep to maximum.

Model	Capacity	Speed	Weight
86-2V20	2000 lb.	19 f.p.m.	78 lb.
86-2V20L*	2000 lb.	19 f.p.m.	78 lb.
86-2V10	1000 lb.	35 f.p.m.	78 lb.
86-1V10	1000 lb.	19 f.p.m.	28 lb.
86-1V10L*	1000 lb.	19 f.p.m.	28 lb.
86-1V5A	500 lb.	35 f.p.m.	28 lb.
86-1V3	300 lb.	80 f.p.m.	28 lb.

** Models with link chain*

BULLETIN 86 gives specifications and data on attachments.

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THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

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- **DUST COLLECTORS**
- **SPRAY BOOTHS**
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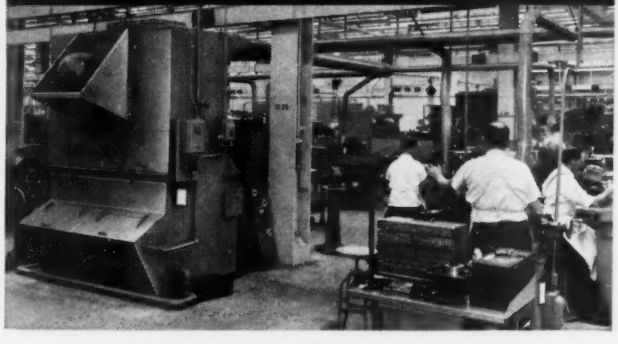

UNI-WASH DUST COLLECTORS

Compact, complete recirculating Water-Type Dust Collectors for industrial processing dusts. Dirt is collected as wet sludge which may be carried away automatically. No moving parts. Extremely efficient for grinding operations. Eliminates danger of explosion from magnesium and aluminum dust. Proven in foundries. Standard Units available.

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Alkali Fluoborates

Ammonium Fluoborate
Potassium Fluoborate
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Better Heat Treating

Baker & Adamson Alkali Fluoborates are easily-handled purifying salts which the foundryman can use like precision tools for a wide range of purposes when casting magnesium, or when melting, heat treating or refining aluminum.

Better Castings

When used as a purifying flux in aluminum melting, B&A Potassium Fluoborate improves the mechanical and physical properties of the casting, resulting in increased tensile strength, greater elongation, improved machinability. These results are obtained with the addition of just one to four ounces per hundred pounds of metal.

Excellent Oxidation Inhibitors

In magnesium casting, B&A Alkali Fluoborates are used with both green sand and core sand to provide a protective atmosphere which prevents oxidation. Foundries using these fluoborates have obtained better castings with fewer rejects. Also, core making is easier and the resulting cores are faster to collapse and easier to shake out.

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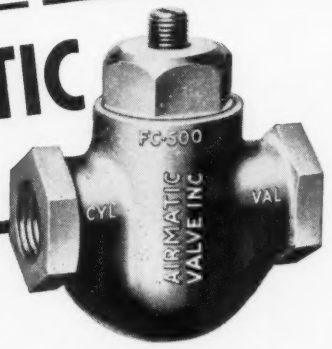

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Airmatic Valves are simple in design — compact. Yet they are extremely efficient in performance and adaptability . . . Afford best arrangements for machine tool application. A complete line of 2-way, 3-way, and 4-way valves available for either high-pressure or low-pressure installations.

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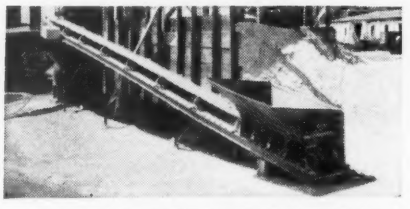
you haven't heard of the . . .



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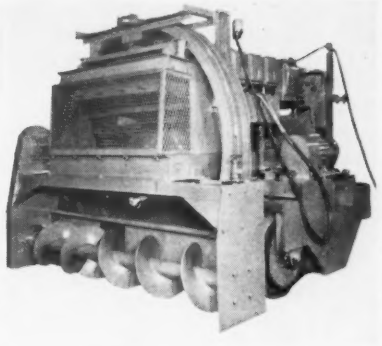

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Mixes, adds water, lifts all sand from floor, screens, magnetically separates, aerates. Cools hot sand. Cuts swath to 104", turns in 63" radius, Straddles 24" high x 70" windrows. Capacity to one ton per minute. Three foundry-proved sizes.

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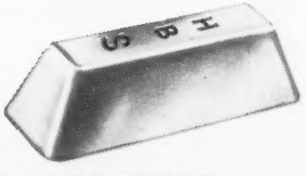

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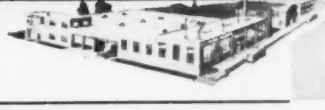

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$15
1/16" to ¼" pipe size
Any length nozzle desired

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Pipe size	1/16"	⅛"	¼"	⅜"	½"
Price F.O.B. Hamilton, O.	$15.00	$15.00	$15.00	$17.50	$22.00

Prices complete with 5 ft. suction hose

EXTRA LONG NOZZLES FOR ⅜" SIZE
This size Sprayer can be furnished with nozzles up to 48" long for spraying ingot molds and hard to reach places . . . also available with curved nozzles up to 15" long.
Long Nozzle Sprayer $22.00

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We manufacture an extensive line of Aftercoolers (Vertical and Horizontal). Separators ¼" to 6". Aftercoolers 50 cfm. to 10,000 cfm. Traps, (Air and Oil)

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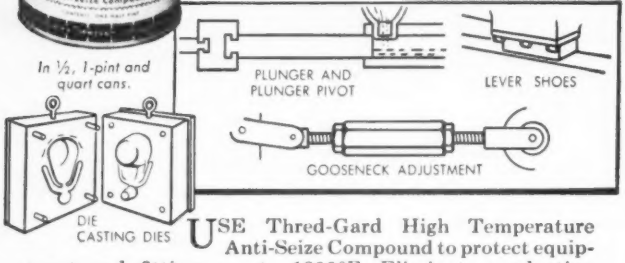

USE Thred-Gard High Temperature Anti-Seize Compound to protect equipment and fittings up to 1200°F. Eliminate production losses and maintenance costs due to heat strain, seizing and galling.

Here's what a drop or two of Thred-Gard will do:

Die casting machines—Reduce down time by insuring continuous, long lasting operation of plunger, plunger pivot, lever shoes and gooseneck adjustment.

Die casting dies—Insure efficient, uninterrupted operation of ejector pins. Prevent thread fracture on screws and hollow head bolts due to seizing and galling—yet, initially, permit them to be drawn to a greater degree of tightness. Save money on your die casting operations. Ask about Thred-Gard. Request a free sample.

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equal to the heaviest ply pneumatic tire.

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far superior to any continuous tread tire. Mitco Tires have sure-grip tread.

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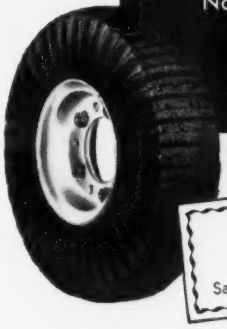

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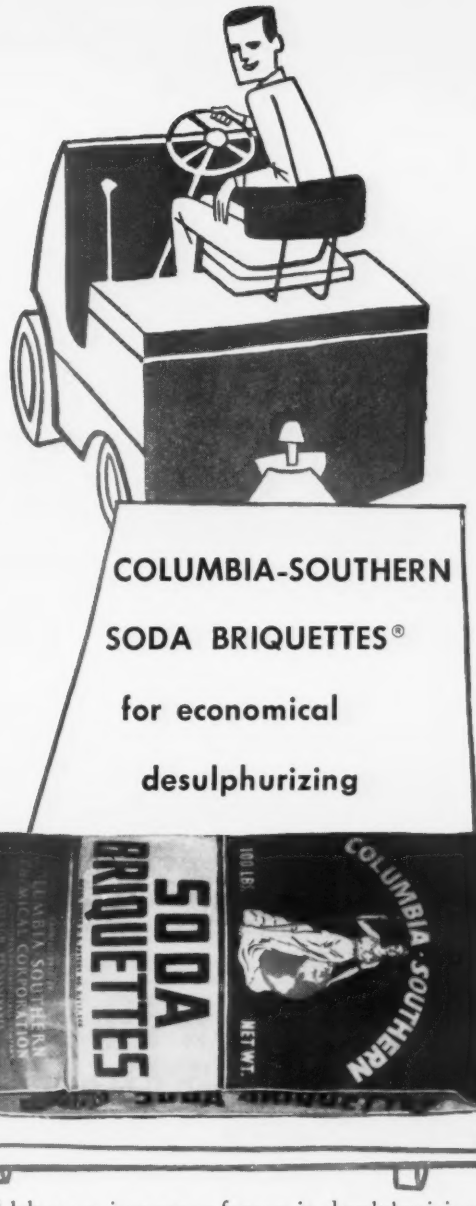

Time and labor are important factors in desulphurizing and cleansing iron as is true in every other Blast Furnace and Foundry operation.

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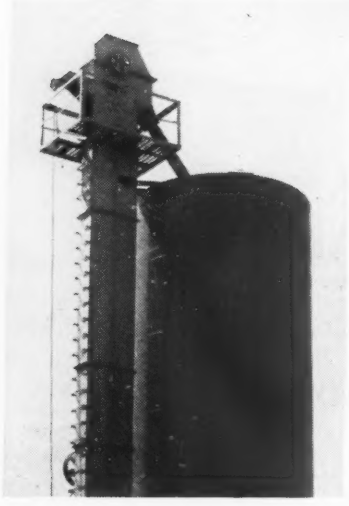
for LOW-COST HANDLING of FOUNDRY SAND

BAUGHMAN "Job-Fitted" CONVEYORS



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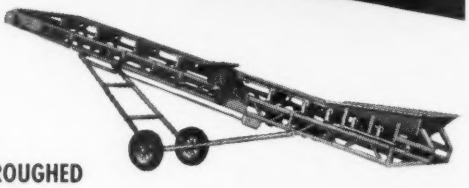

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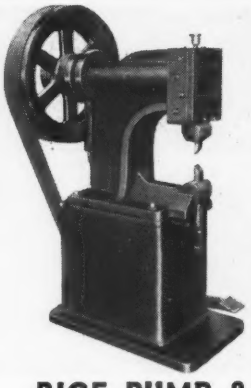

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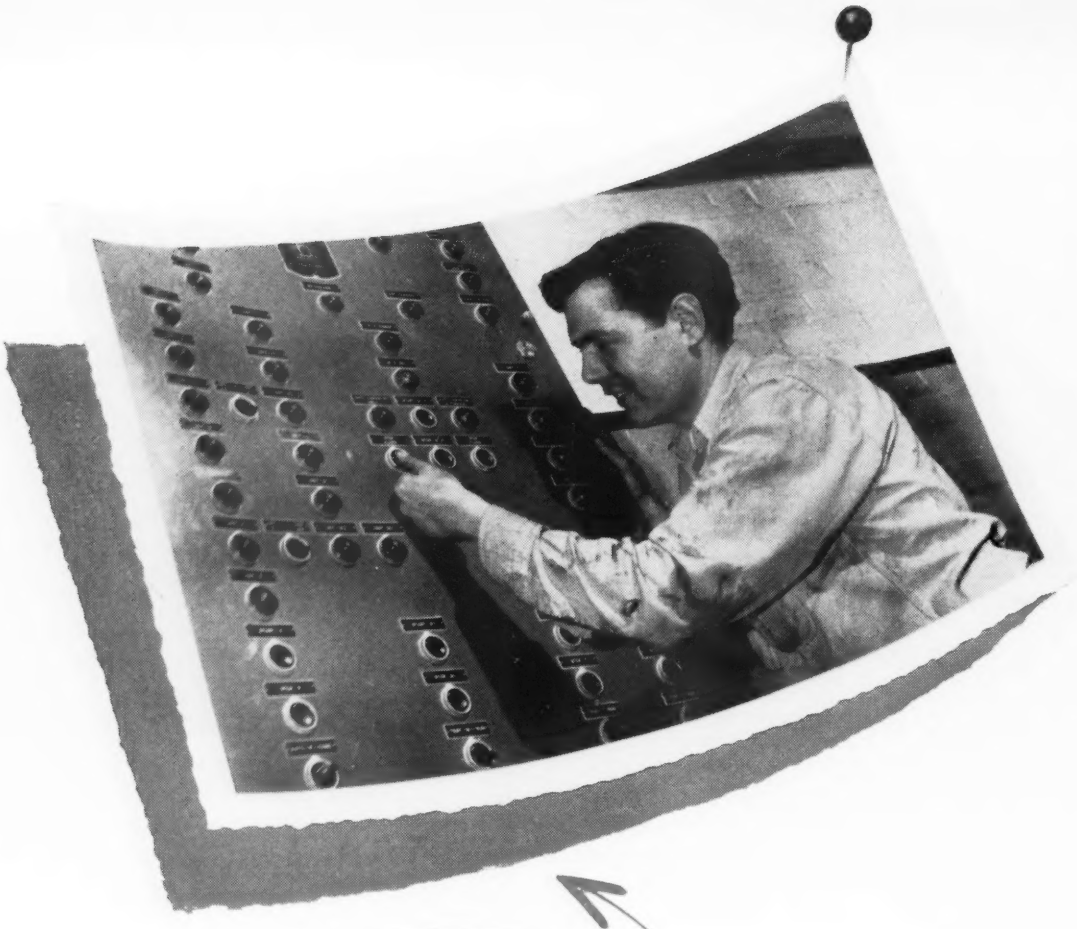

Know Where This Picture Was Taken?

Can you name the *kind* of plant? Would it surprise you to know this picture shows a *foundry* operation? This is the control panel for automatic molding and cleaning equipment.

Eight million dollars a month is going into new equipment and facilities for modernizing and mechanizing the foundry industry—one million dollars *an hour* into materials and supplies. This is *BIG* business. It takes *specialized* effort concentrated on the foundry market to grab off your share.

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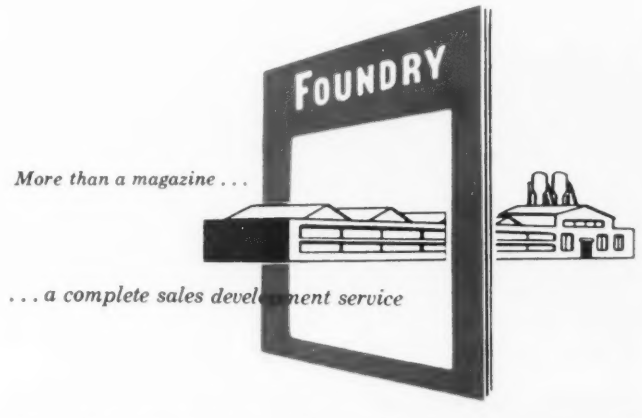
This is all part of FOUNDRY's PLUS 5 Sales Development Service to help you get more business.

And remember, to quickly get your story across, there is no coverage or readership that even comes close to FOUNDRY's tremendous influence upon foundrymen everywhere.

Write us for PLUS 5, the folder that fully describes the *extra* services available from FOUNDRY to help you make your advertising to the market more productive. FOUNDRY, Penton Bldg., Cleveland 13, Ohio.



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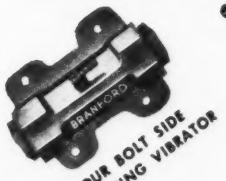
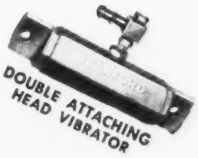


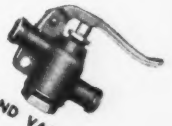
FOUR BOLT SIDE MOUNTING VIBRATOR

HOSE CLAMP

TWO BOLT SIDE MOUNTING VIBRATOR


DOUBLE ATTACHING HEAD VIBRATOR

1915
BRANFORD
VIBRATORS
USA


HAND VALVE

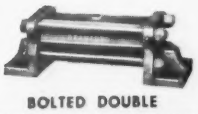
RENEWABLE NOZZLE CLEANER & SPRAYER

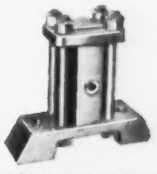
CLEANER & SPRAYER

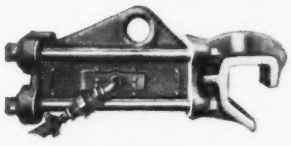
HOSE NIPPLE

STARTING VALVE

HOSE ELBOW


BOLTED DOUBLE ATTACHING HEAD VIBRATOR


END MOUNTING VIBRATOR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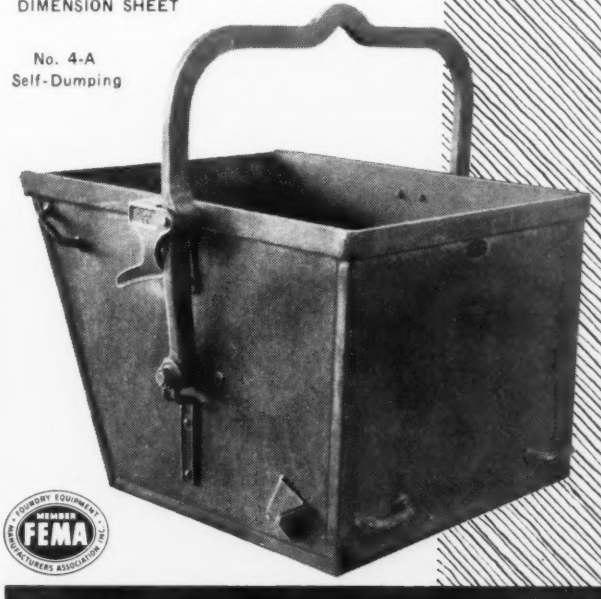
Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

WRITE TODAY FOR NEW BULLETIN AND DIMENSION SHEET

No. 4-A
Self-Dumping



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READING, PENNA.

You'd need several machines to do all the different jobs possible on one

BOKOE No. 3 Universal Miller

For non-ferrous, cast iron and alloy steel tooling, patterns and production to close tolerances.

Use it for radial drilling in addition to vertical milling, universal milling and boring up to 11⅞".

- Column swivels 180° in either direction
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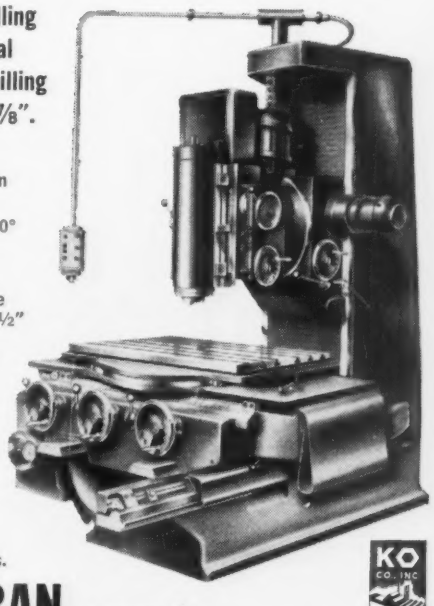

Smaller models, too.
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KO CO., INC. INDUSTRIAL IMPORTERS
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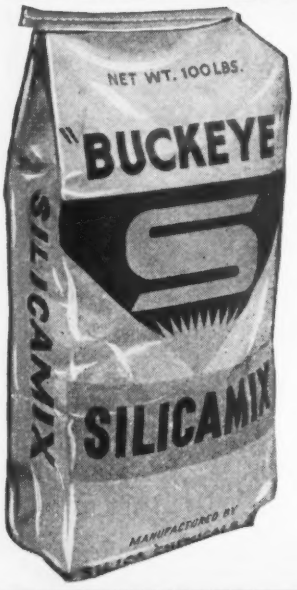
SILICAMIX . . . a new, superior, gun-shot CUPOLA PATCH



BUCKEYE SILICAMIX is a new development that provides a superior gun-shot mix for patching gray iron cupolas. Its uses provide the same qualities and results from this gun-shot material that have been so popular with the well known Buckeye Silica Firestone. Buckeye Silicamix is actually small pellets of this firestone, coated with clay—a special refractory fire clay. When applied under pressure with water, Buckeye Silicamix sticks tighter to the cupola walls, keeping costly "drop" to a minimum.

Try SILICAMIX on your next cupola lining job . . . . . .

A Buckeye refractory engineer will bring you free samples for inspection and trial. See for yourself how its faster "buckshot" action adds up to more economical cupola operation.

SILICA CHEMICALS, INC.

Subsidiary of The Cleveland Quarries Co.

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their light-weight characteristics
make for safe, easy-to-handle,
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The simplest and most complete method of costing ever prepared for nonferrous foundries is found in

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(Non-Ferrous Founders' Society Publication)

Up-to-the-minute guide for costing in both small and large foundries. Prepared by practical foundrymen, based on 10 years of research and experience of the industry under Government Pricing Regulations.

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AUTOMOBILE CYLINDER LINERS

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WATER-COOLED
Model M-WC
(Illustrated)

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Write for new Bulletin # 153 Illustrating Model M-WC

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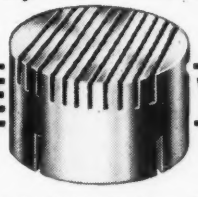
BETTER CORES
By Inserting



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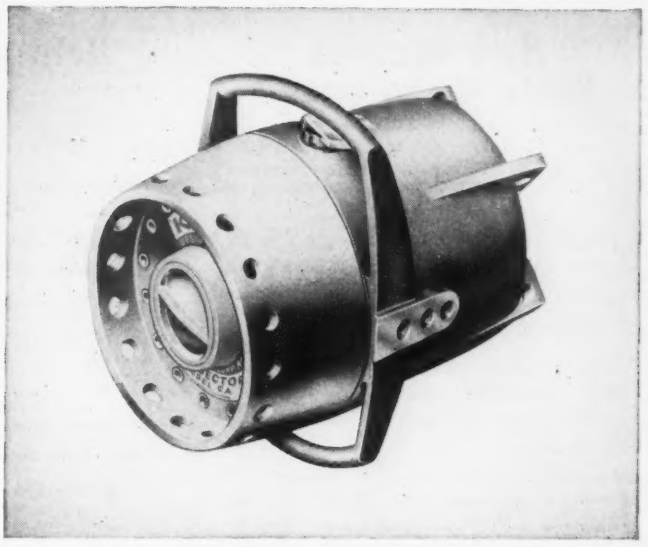
The KEL-RAY® Projector
a portable tool for low-cost radiography



Here is a new development employing radioactive cobalt, iridium, or cesium as a source of gamma rays. One of the most practical means yet devised for industrial non-destructive testing, the KEL-RAY Projector lowers costs and simplifies procedures wherever radiographic testing can be applied. Here's why:

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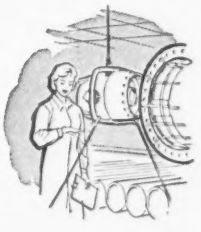

SAFE—Ruggedly constructed, equipped with tamper-proof shutter, it is designed and built to keep radiation leakage at a minimum—well below AEC and ICC safety requirements.

ECONOMICAL—Initial and operating costs are low. Requires no maintenance during life of isotope. Set-up time and man-power are minimized.

EASY TO USE—Simple to operate on light or heavy material up to 8 inches thick by anyone properly trained.

For information on how the KEL-RAY Projector can meet your needs, write for Bulletin P196F.

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CERAMIC MATERIALS • TIN & TIN CHEMICALS • METALS & ALLOYS • HEAVY MELTING SCRAP

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Supervisor For Investment Casting Operation

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The man we're looking for has had comprehensive experience in precision plaster and investment casting procedures for nonferrous metals (aluminum, magnesium and brass). He will have the ability and desire to supervise and he will be ambitious enough to work towards greater responsibilities. Chances are a man under 30 would not have the necessary experience, nor is it likely that a man over 50 would want to make a change.

If you're our man, then you can look forward to working with friendly associates in a company that offers generous benefits, and opportunity for executive advancement.

We are located in metropolitan New Jersey (just 30 minutes away from New York City). Salary will match both your experience as well as the responsibilities entrusted to you.

Please tell us ALL about yourself in your letter. Adress: Box 975, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR METALLURGIST—PLUS

Age 32 to 50, must have extensive experience in low carbon and stainless steel and capable of directing melter. Knowledge of sand control, gating, risering, molding, core making and general foundry operations helpful. Preference given to man with executive leanings and opportunity of becoming Assistant Manager or Manager. A wonderful opportunity for a live wire who is capable and willing to give freely of his utmost. Location Massachusetts, job shop, 1 to 20,000 lb. castings, iron, bronze, alloy steel, 130 men. In reply enclose photograph and full particulars including approximate salary required. Your record must be as clean as a hound's tooth. We want a good man in the fullest sense of the word.

BOX 102, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERINTENDENT

Medium-heavy gray iron foundry wants superintendent. Age between 30 and 40, must have all-around job shop experience and an excellent knowledge of human and employee relations. Located in Midwest.

BOX 131, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

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For progressive Milwaukee foundry. Coreroom knowledge and supervisory experience required. Long established company offers opportunity. Submit applications including qualifications and experience. All replies will be kept confidential. Our supervisors know of this ad. Address: Box 116, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Technically trained with malleable experience for well established progressive, jobbing and semi-production foundry in middlewest employing 150 men. Capable of supervising batch type air furnace melting, annealing and laboratories. Submit application including personal data, resume of qualifications and experience, references and salary expected. Address: Box 979, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Development and service work involving moderate travel for large corporation producing wide variety of melting materials. Must have sound metallurgical education and wide knowledge of iron and steel foundry technology. Location, middle west. Address: Box 992, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PATTERN SHOP SUPERVISOR

A progressive midwest foundry that employs 250 men is seeking a qualified supervisor to take charge of its Pattern Shop and Storage consisting of about 20 men. Along with technical ability the successful applicant will require first class organizing and administrative qualifications. Age 35 to 45.

In reply provide complete education and experience background. Replys will be held strictly confidential.

BOX 136, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WOOD PATTERNMAKER

Must be experienced in all phases of wood patternmaking. Good working conditions in modern pattern shop.
This company is a major manufacturer of special machine tools, with an ideal geographical location. Please submit resume including personal description, experience and financial requirements.

EMPLOYMENT MANAGER
NATIONAL AUTOMATIC TOOL CO., INC.
RICHMOND, INDIANA

DESIGNERS-DRAFTSMEN-ENGINEERS

Experienced in foundry layouts and equipment. Send experience record, personal data, recent photo and references prior to personal interview.

BOX 142 FOUNDRY
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Gray iron foundry Great Lakes area producing light to heavy castings in pits, molds, rollovers and squeezers. We need high quality man with administrative and executive abilities who can work into a top management position carrying heavy responsibility and corresponding financial return. Knowledge of metallurgy will be helpful. Address: Box 138, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Excellent opportunity in medium-sized iron, brass and aluminum foundry located in the southeast. Require superintendent with thorough knowledge of machine and floor molding, gating, sand control, both jobbing and production work. Applicant must know all phases of foundry work and be capable of producing pressure-tight and porous-free castings economically. Send full resume, picture, age, and salary expected. Address: Box 982, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

WORKS MANAGER

We are seeking a man to direct all manufacturing of our company, which is located in a good small Eastern city. Our reputation for quality is excellent, our operations have been profitable over many years and annual sales volume is now about $10,000,000.

Iron or Steel Foundry Experience Essential

We would like a man who has directed the manufacturing of medium and heavy industrial metal products. A man with the right potential can look forward to becoming general manager in the near future. Age should be between 40 and 55 years. Salary will be in the $20,000 to $25,000 range.
State briefly pertinent experience, age and home telephone. All replies confidential.

BOX 101, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PLANT ENGINEER

With some production experience desirable for industrial sand producer.

NUGENT SAND CO.
P.O. BOX 506 MUSKEGON, MICHIGAN

SALES MANAGER

Familiar with stainless steel and high temperature alloys. Technical background preferred. Location western Michigan.

GEORGE & DIX
Management Consultants
FEDERAL SQUARE BUILDING
GRAND RAPIDS, MICHIGAN

PATTERN SHOP FOREMAN

With good knowledge of molding practices, preferably steel. Responsible for all work pertaining to patterns. Keep record of supplies and be able to estimate pattern costs. Ability to plan and direct the work of shop employees. Address: Box 141, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ONLY THE BEST

We need competent metallurgist who likes people—therefore enjoys success in technical sales; who knows ferrous melting; who likes to guide his own destiny—therefore aspires to management; who is resourceful, imaginative, creative—therefore above average. Knowledge of tool, stainless, superalloys desirable. Home base will be Detroit area. Tell us about yourself and we'll do the same. Address: **WAI MET, 1999 GUOIN, DETROIT 7, MICHIGAN.**

BRASS FOUNDRY SUPERINTENDENT

Must have working knowledge of brass metallurgy, at least 10 years of permanent mold, die cast or sand foundry experience, under 50, salary open. Chicago area. Address: Box 112, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Help Wanted

HELP WANTED

General Maintenance Foreman. Mechanical or Electrical Engineering background preferred. To head maintenance department of a leading steel foundry in east. Should be well versed in present day managerial problems and abreast of all phases of foundry and plant maintenance engineering. Job challenge, excellent pay, job security, good working conditions, promising future are available for the man who qualifies. For details, write in confidence to:

BOX 999, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CLEANING ROOM FOREMAN

By foundry employing from 15 to 25 molders on light and medium weight castings. Must be experienced in all phases of cleaning room operations, capable of establishing piece work prices and able to maintain good labor relations. This is a permanent position in a good organization. In reply state age, experience, names of past employers and salary expected. Address: Box 115, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Expanding industrial engineering to foundry operations requires Industrial Engineer with 2-3 years foundry experience. Degree, MTM, and Scheduling Training desired but not limiting. Non-Contributory surgical, hospitalization, and profit sharing program. Send resume to: L. L. STOUFFER, VICE PRES., PANGBORN CORPORATION, HAGERSTOWN, MD. Mark Correspondence "confidential".

NONFERROUS FOUNDRY FOREMAN

Medium-size aluminum foundry near Cleveland, specializing in medium and large jobbing work. Must know all phases of foundry operations and aluminum alloys. In reply give age, experience, references and include photograph. Address: Box 997, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY METALLURGIST

To take charge of all foundry operations and quality control of company producing investment castings. Applicant should have experience with ferrous and nonferrous alloys, vacuum techniques. Should be capable of initiating alloy development programs, and generally, be development minded. Salary commensurate with ability and experience. Midwest location. Please forward resume to: Box 135, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Gray iron jobbing foundry located Lower Michigan producing light and heavy castings on jobbing floors and machines. We must make large increase in our production to meet demands and are only interested in highest quality man who has qualifications to assume within a few years a top position carrying high financial remuneration. Address: Box 137, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGISTS

Company engaged in basic process and pyrometallurgy requires several men for production, development and quality control who have some experience in one or more of the following: smelting and refining, steelmaking, or electric furnace operation. Excellent opportunities for qualified men. Hospitalization, insurance and pension plan provided by Company. Plants located midwest, north and south. All replies held strictly confidential. Submit detailed resume. Address: Box 106, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN: CALIFORNIA

Medium size Nonferrous production foundry requires services of experienced foreman, with molding, coremaking, and melting background. State age, experience, when available. Salary open. Address: Box 143, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN

Hardware manufacturer located in Southern Connecticut seeks man experienced in all phases of nonferrous foundry operations, non-mechanized, shell molding and green sand molding. Excellent benefits. Address: Box 108, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PRACTICAL MAINTENANCE ENGINEER

With foundry experience if possible. Academic training not essential but helpful. Apply in writing. Address: Box 133, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

SERVICE ENGINEER WANTED

Young man, with foundry sand experience, college education, and native intelligence has a real opportunity with growing, aggressive supply company if he is sales minded and is willing to travel, learn and work. Send complete record, photograph and salary requirements.

BOX 103, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PERMANENT MOLD DESIGNER

Qualified to design efficient, troublefree molds. Must be a good mechanic, ingenious, have solid foundry background. Must have qualifications to take his place as part of management nucleus of rapidly growing, progressive organization. Location New Jersey. Salary open. Please send complete resume.

BOX 128, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY ENGINEER

Large alloy foundry in midwest desires foundry engineer. Practical experience in all phases of operation necessary. Possible future to general supervision if capable. Write particulars. Address: Box 134, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Most modern and progressive steel foundry in the middle west. Advise full particulars. Address: SWEDISH CRUCIBLE STEEL CO., 8561 BUTLER AVE., DETROIT 11, MICHIGAN.

ASSISTANT PLANT MANAGER

To assist in managing of cast iron plumbing fixture plant. Give full particulars. Good opportunity and salary. Address: Box 130, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

For brass and aluminum foundry located in Pittsburgh. Must be first class molder willing and able to start as working foreman. Address: Box 113, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

FOUNDRY SUPERINTENDENT

Thirty-three years' practical experience, ferrous and nonferrous, jobbing and production, fully qualified to take complete charge of all foundry operations, mix metals by analysis, iron, semi-steel, ductile iron, brass, bronze, copper, aluminum in green sand, dry sand, semi-shell and shell molding. A-1 in plaster molds and cores. Capable to handle pattern shop. Address: Box 129, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WORKS MANAGER—SUPERINTENDENT

University education, 21 years' experience in plain and alloy gray irons, carbon, low and high alloy steel. Castings from ½ lb. to 15 tons, know electric arc, induction, open hearth furnace and cupola operation. Have been metallurgist and chemist, superintendent, works manager, general manager, vice president, foundry consultant. Will relocate. Age 46, married. Address: Box 145, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Experienced in most phases of foundry metallurgy including melting, heat treatment, sand control and laboratory. Ten years with present company as metallurgist; 42 years of age, married, 2 children. Address: Box 144, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR GENERAL FOREMAN

Thorough knowledge of all phases of nonferrous metals. Practical man, 36 years' experience, molder, foreman, superintendent, well versed all departments. Available immediately. Address: Box 109, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SHELL PROCESS

Four years' experience, developing and supervising shell production. College graduate, age 32, married. Desire greater responsibility, any phase of process. Address: Box 110, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

ARE YOU STILL

looking for that young foundryman with an engineering degree and with years of practical experience from modern jobbing and production gray iron shops? The future minded foundry manager will find the solution to his problem by answering this ad!—Aggressive and hardworking and can think ahead. Journeyman. Now employed in supervisory capacity. Desire position with advancement opportunity with progressive organization. Go anywhere. Address: Box 983, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM FOREMAN

Desire position as working foreman or assistant. Forty-one years old, 22 years' experience in nonferrous jobbing and production shops. Day work or incentive. Some knowedge of cost and molding practice. Three years in charge of coreroom. Wish to relocate in upper middle west or west. Would like position where I can increase my knowledge and further my training for advancement. Address: Box 981, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES POSITION WANTED

Former supervisor, ferrous foundry with 28 years' practical experience. Know every phase of foundry operation. Although I have never sold, my background could help to build your sales to foundries in New York and surrounding territory. Am seeking a sales position on a salary plus commission basis or an outside position dealing with foundries. What have you to offer? Address: Box 132, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN OR SUPERINTENDENT

Thirty-three years' practical experience, 20 years as supervisor in both jobbing and high production shops. Experienced in rigging and gating for fast production and quality castings, both gray iron and nonferrous metals. Address: Box 966, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR GENERAL FOREMAN

Gray iron or nonferrous. Prefer small to medium shop, jobbing or production. Practical man, thirty years' experience, molder, foreman, superintendent. Well versed all departments. Available immediately. Address: Box 978, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Due to forced age retirement from present connection I would like to contact a foundry organization that could use my years of supervision experience in jobbing and captive foundries. Thorough in all phases of foundry operation. Address: Box 120, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Age 41, with 22 years experience in a medium-sized gray iron jobbing and semi-production foundry. Well versed in all jobbing shop problems. Practical foundryman with some technical knowledge. Address: Box 124, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WORKS MANAGER-SUPERINTENDENT

Capable of operating a 350 man organization, 23 years of experience in casting ferrous and nonferrous metals in sand, permanent and investment molds profitably. Address: Box 125 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR MANAGER

Thorough knowledge of all phases of gray iron and malleable foundry operation. Eighteen years' experience in supervision and management. Age 44. Can furnish the best in references. Presently employed. Address: Box 107, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON SUPERINTENDENT

Age 40, desire southern California location, 22 years' experience. Address: Box 127, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Positions Wanted

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 976, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD FOUNDRYMAN

Graduate metallurgist experienced in design, estimating, operation. Over 20 years in nonferrous castings, including sand, shell and die casting. Address: Box 984, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Inspection and shipping. Eighteen years' experience in all phases of this work. Large and small castings. Will relocate. Married. Best of references as to character and ability. Address: Box 140, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOREMAN

Cleaning room. Experienced in all phases of cleaning room operations. Wish to relocate. Will furnish all information requested. Address: Box 973, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM FOREMAN

Age 47. Experienced in all phases of coremaking. Rig boxes for all types of core blowers. Very good on production. Will relocate. Would be interested in selling proposition. Address: Box 105, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representatives Wanted

SALES REPRESENTATIVES WANTED

Commission basis, brass and bronze production foundry. Competitive prices. Foundry is large, mechanized and is located in Los Angeles, California. Representatives wanted for the southern California territory; the northern California territory; and the Oregon-Washington territory. No objection to other lines. Address: Box 111, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANUFACTURERS' REPRESENTATIVE

For allied foundry equipment. Repeat yearly sales. High commission rates, leads and established accounts furnished. Must cover middle Atlantic States for distribution from Philadelphia, Pa. Address: Box 123, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALS, MINERALS, CHEMICALS

Salesman with industrial clientele, wanted on HIGH COMMISSION. Write complete personal and sales data in confidence. Include photo. BRAM CHEMICAL CO., 820 - 65th AVE., PHILADELPHIA 26, PENNSYLVANIA.

REPRESENTATIVES

To sell Pressure Cast Matchplates. Will give exclusive territory. Address: Box 104 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

REPRESENTATIVE

To sell investment and other products to the investment casting industry. New and improved materials. Address: Box 117, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representative Available

MANUFACTURERS' REPRESENTATIVE

Desire additional lines on commission basis. Presently selling leading line of shot and grit, in western, central and southern Ohio. Address: Box 974, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited
From Employers and Qualified Applicants.
For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **HARRISON 7-8600**
JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

Foundry Consultant

HAROLD J. ROAST, FIM, FCS

BRONZE FOUNDRY CONSULTANT

50 Years' Experience

AVAILABLE COAST TO COAST

140 GROSVENOR AVENUE

OTTAWA, ONTARIO, CANADA

ELECTRIC FURNACE CONSULTANT
BASIC AND ACID PRACTICE

Supervisor on electric furnaces for 35 years. Thorough knowledge of:

1. All kinds of plain carbon and alloy steel.
2. Analysis control.
3. High standard of physical properties.
4. Low Cost with high productivity.

EUGENE H. WEAK **2933 HIGHWAY AVE.**
HIGHLAND, IND. **PHONE: TEMPLE 8-1244**

Wanted-To-Buy

WANTED TO BUY

66"-72" Cupola with or without blower or charger. Must be late model and in good condition.

MEECH FOUNDRY, INC.

9906 MEECH AVENUE CLEVELAND 5, OHIO

WANTED TO BUY

1—Stationary sand slinger with No. 19 head
1—feeder
1—muller
1—shakeout, 48" x 60"

STEARNS MANUFACTURING COMPANY, INC.
ADRIAN, MICHIGAN

WANTED TO BUY

Used Crane Runway

Runway, rails and supporting A frames for 15 ton bridge crane. Span 56 ft. 11 inches x 240 of travel. Foundation to top of rails 40 ft., crane wheel loads 30,500# on 11 ft. 9 inch wheel base.

BOX 100, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

WANTED TO BUY

Used indirect-arc electric furnace, Detroit Electric Rocking, type IC, PT, or NP, 10-17 lb. capacity, 220 volt. Used gas ovens, Buzzer, type 2436 or equivalent. Address: Box 119, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE

THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

OPPORTUNITY WANTED

Two young graduate engineers with 8 years' foundry operating experience desire connection with small foundry operation in owner-management capacity. Investment capital available. Address: Box 121, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Open Capacity

OPEN CAPACITY

Gray Iron, Cope and Drag Patterns also Squeezers.

PHARISBURG FOUNDRY CO.

MARYSVILLE, OHIO

RFD #1 **PHONE 21142**

Foundries For Sale

FOR SALE
Land and Buildings
of
THREE RIVERS CASTING CO.
Three Rivers, Michigan
BARGAIN AT $55,000.00

Brick and concrete block and steel construction, concrete floors: 28,000 square feet. Served by New York Central RR and Michigan Central RR. Lloyd-Thomas Appraisal $175,000.00 plus land. Oil fired boiler; overhead heating units; sprinkler. With or without foundry equipment. Immediate possession. Complete details upon request.

BOX 937, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

ELECTRIC STEEL FOUNDRY
FOR SALE

Long established, ample buildings and storage facilities. In excellent marketing area. Complete $90,000 with $60,000 cash required. Address: Box 126, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PUBLIC AUCTION SALE

A COMPLETE ELECTRIC ALLOY STEEL FOUNDRY AND SURPLUS MACHINERY AND EQUIPMENT OF

MICHIANA PRODUCTS CORPORATION

INCLUDING SURPLUS MACHINE SHOP and SHEET METAL FABRICATING EQUIPMENT

REPLACEMENT VALUE OVER $750,000

ON THE PREMISES 2 MILES EAST OF MICHIGAN CITY INDIANA on ROUTE 12

TUESDAY JUNE 19, 1956 at 10 A.M. E.S.T.

MUCH OF THIS EQUIPMENT INSTALLED NEW 1951

Inspection June 15-16-17-18—Bet. Hours 9:00 A.M. to 4:00 P.M.

ELECTRIC MELTING FURNACES: Allis-Chalmers Induction with 2—600# furnaces, 2 Swindell 2500#, 1 Swindell 1500#.

SAND SYSTEMS: 9 Station National Engineering Co. system with Simpson #2H Muller, aerator, dust hood, 2 bucket loaders, 1 bucket elevator, sand dist. belt, 5 facing hoppers, pouring deck, Pallet dump and return, oscillating conveyors, casting sorting conveyor, dust collector, storage bin.

SLINGER SYSTEM: B & P Staty. Sand Slinger, 5′ x 8′ Simplicity Shakeout, Syntron Vibra Feeder, Trough conveyor, Simplicity Os-A-Veyor, magnetic pulley, bucket elevator, sand screen, storage bin, batch hoppers, bucket loader, #2 Style H Simpson Mixer, plate feeder, dust collectors.

MOLDING MACHINES: Tabor 30″ x 42″ 1000# Shockless jar flask lift molding machine, new 1952; Tabor portable jar power rollover draw, 30″ x 51″ table; Osborn jolt rollover draw, 23″ x 38″ table, air clamps; (4) Spo 110J Jolt squeeze molding machines, 15″ x 20″ table; (4) International portable jolt squeezers, 14″ x 21″ table.

CENTRIFUGAL CASTING MACHINES: (3) 200#—300#—4000# capacities.

CLEANING ROOM: American blast room, Slytable type shot blast, Pangborn and Whiting dust arresters, 24″ x 24″ Whiting tumbling barrel.

CORE ROOM: (3) Oil fired core ovens, core plates, coremakers' benches, American rod straightener with gagger attachment.

HOISTS AND CRANES: 5 ton Milwaukee OET crane, 56′-6″ span, 5000# Shepard Niles floor controlled bridge; (5) Keller 1000# and 2000# air hoists; (3) Whiting 1 ton electric hoist, bridge cranes, jib cranes, 1 ton Yale gantry crane.

FLASKS: Hines "Popoff" and Snapflasks with jackets, Sterling and Fabricated steel flasks.

LABORATORY EQUIPMENT: Riehle 100,000# tensile tester, Sontag Universal impact machine, microscope, Wilkins Anderson Electro analyzer, Buehler polisher, Hevi Duty Carbon determination furnace, Ernst Leitz-Wetzlar Metallscope Camera, (3) Christian Becker Chain-O-Matic balance, Leco 100 Carbon Determinator Brown Controls, Coleman Spectrophotometer, Pyro optical pyrometers, Tinius Olson Testers, Sand testing equipment.

MISCELLANEOUS: (6) Geared ladles Modern and Whiting makes, ladle dryers, fans, mancoolers, rammers, roller conveyors, 42″ Wayne gasoline driven floor sweeper.

MATERIAL HANDLING EQUIPMENT: 5 ton Krane Kar Model AX, 15000# Hughes Keenan Roustabout crane, Baker 5 ton crane Ready Power, Ross 6000# fork lift pneumatics, Baker 6000# fork lift, Baker 10,000# Hylift platform, Towmotor 5000# fork lift, Caterpillar D2 Diesel front end loader ⅜ yard bucket, Chevrolet station wagon, tractor and trailer, Stake truck.

METALWORKING MACHINERY: Lathes, turret lathes, drill presses, tapping machines, grinders, threaders, shears, press brakes, rolls, punch presses, welders, tumbling mills, saws, plus many other items too numerous to mention.

MEYER GRONIK CO.
INDUSTRIAL AUCTIONEERS
135 W. Wells Street Milwaukee 3, Wisconsin

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR COMPRESSORS

1—CHICAGO-PNEUMATIC Size 7½ x 6 Single Stage horizontal, 20 HP Motor, Starter etc. 220/440 volts.
4—GARDNER-DENVER Model ADR, 4" stroke, 15 HP Motor & electrical 220/-440/3/60 cycles 125 PSI pressure, w/-storage tanks, New in 1950's.

AIR HOISTS

75—INGERSOLL RAND RC-5, 500 lbs.
10—INGERSOLL RAND LC-7, 700 lbs.
3—INGERSOLL RAND Size "AN" 500 lbs.
6—INGERSOLL RAND Size "BN" 1000
1—INGERSOLL RAND Size "E" 10,000
5—CHICAGO PNEUMATIC 2-3-5 Ton Cap.
16—DETROIT 1-2-5 Tons Cap.
3—THORS 2-3-5 Tons Cap.

BUCKET ELEVATORS

1—LINK BELT 30' Centers, 10" x 7" Buckets, w/Motor and Drive.
1—LINK BELT 35' Centers, 12" x 7" Buckets, w/Motor and Drive.
1—LINK BELT 40' Centers, 14" x 7" Buckets, w/Motor and Drive.
1—LINK BELT 50' Centers, 16" x 8" Buckets, w/Motor and Drive.

AIR TOOLS

200—INGERSOLL RAND & CHICAGO PNEUMATIC, Grinders, Chippers, Bench & Floor Rammers.

ELECTRIC HOISTS

1—Comet 1000 lbs. capacity.
1—SHAW Box 1000 lbs. capacity.
1—ROBBINS & MEYERS, 4000 lbs. cap.

CUT-OFF MACHINES

1—DEWALT model ME2 cut-off saw, 10 HP motor, 24" Carboloy blades.
3—TABOR model C10AF, Abrasive Disc, 16" Wheel, 10 H.P. Motor.
1—GROB Band Saw, Type OS-36, open end, 36" throat, MD.
2—TESSMER Model "H" & "I" Sprue Cutters.

CORE ROD STRAIGHTENERS

1—AMERICAN Type D, Pneumatic ¾" Straightener, 1¼" Shear.
2—CLIMAX #2, 2A, 1/16" to ¼".
1—CLIMAX #3, ¼" to ⅝", Length 10".

CORE GRINDERS

2—MILWAUKEE Rotary Type, Model 70-12, 70" Dia. Table, Very Late.

CORE BLOWERS

2—CHAMPIONS CB 10, Max. Core 10 lbs.
2—CHAMPIONS CB 400, Max. Core 300.
1—DEMMLER No. 55 Max. Core 6 lbs.
1—DEMMLER No. 1, Max. Core 10 lbs.
1—DEMMLER No. 1-E, Max. Core 10 lbs.
2—DEMMLER No. 2K, Max. Core 20 lbs.
2—DEMMLER No. 2E, Max. Core 20 lbs.
2—DEMMLER No. 2, Max. Core 20 lbs.
2—DEMMLER No. 3, Max. Core 35 lbs.
2—DEMMLER No. 3K, Max. Core 35 lbs.
2—DEMMLER No. 3E, Max. Core 35 lbs.
1—DEMMLER No. 4, Max. Core 100 lbs.
1—DEMMLER No. 4E, Max. Core .. lbs.
2—INTERNATIONALS No. SB, 11 Max. Core 15 lbs.
2—INTERNATIONALS No. SB 13, Max. Core 30 lbs.
2—OSBORN No. 92, Max. Core 35 lbs.
2—OSBORN No. 192, Max. Core 50 lbs.
2—OSBORN No. 193, Max. Core 75 lbs.
6—MILWAUKEE TACCONE Model A-3, Max. Core, 4 lbs.
1—REDFORD #1 Bench Type w/cartridges.

CORE OVENS

1—INDUCTION Heating Dialectric, Model M-800A, 600 lbs. per Hr. New.
1—INDUSTRIAL "Revolving Carriers" Continuous, Trays 18" x 80", Gas Fired.
1—YOUNG BROS. 2-Comp. 10 Drawers, Overall 9' x 12' x 8', Gas Fired.
1—MAEHLER SINGLE COMPARTMENT I.D. 96" L x 80" W x 84" High, Gas Fired Recirculating with L & N Controls.
2—DIETERT #500 LAB DRYING TYPE.

CORE ROOM MISC.

37—NEW CORE RACKS, 5' 6" Wide, 6' High, 4' Deep, 5 Shelves, Knocked Down.
20—OSBORN, INTERNATIONAL & TABOR Core Rollovers, Various Sizes.

CUPOLA BLOWERS & ACCESSORIES

1—ROOTS CONNERSVILLE, Size 20 x 44, 7000 CFM, Type HD, 50 HP Motor.
4—LINDBERG Centrifugal Blowers 2100 CFM, with 15 HP Motors.
1—BASIC REFRACTORIES BRI Gun, Model 110, For lighting cupola.
5—WHITING 42" Dia. Charging Buckets.
1—CUPOLA Bondactor.
1—I & R Single Stage FS-367, 100 HP, 9400 CFM.

DUST COLLECTORS & ROTO-CLONES

1—AMERICAN Air Filter No. 12, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 14, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 27, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter Type N, Size 10 with Bench.
1—AMERICAN Air Filter Type N, Size 24, 24,000 CFM, 75 HP Motor.

ELECTRIC ARC MELTING

2—DETROIT Rockers, Indirect Arc, Type AA, 750-1000 lbs. capacity. Complete with 200 KVA Transformers, Control Panels, Automatic Electrode Holders.
2—DETROIT Rockers, Indirect Arc, Type AA, 1000-1500 lbs. capacity. Complete with 250 KVA Transformers, Control Panels, Automatic Electrode Holders.

GAS & OIL FIRED FURNACES

1—LINDBERG FISHER Model MNP, Size 225, Electric Tilt, with Motor & Blower.
6—LINDBERG FISHER Model MNP, Size 1700, Electric Tilt, with Motor & Blower.
3—LINDBERG FISHER Model MNP, Size 2400, Electric Tilt, with Motor & Blower.
2—LINDBERG FISHER, Type BB1, Size 225, Hand Tilt, with Motor & Blower.
12—LINDBERG FISHER, Model SSH, Size 550, Stationary, Motor & Blower.
6—LINDBERG FISHER, Model SSH, Size 150, Stationary, Motor & Blower.
3—LINDBERG FISHER, Model SSH, Size 60, Stationary, Motor & Blower.
10—CAMPBELL HAUSFIELD, Stationary, Size 125 to 250, Motor & Blower.
2—CAMPBELL HAUSFIELD, Model 1PNT, Size 2000 lbs., Electric Tilt, with Motor & Blower.
1—LINDBERG-FISHER Model MNP Size 400, Electric Tilt, with Motor & Blower

GRINDERS—SWING FRAME

1—MARSHKE, 12" x 2", 3 HP.
1—MARSHKE, 20" x 10", 10 H.P.
2—FOX, No. 6, 24" x 10", 15 HP.

GRINDERS—SNAGGING

3—U. S. ELECTRICAL, No. 65, 24" x 3" x 12" Wheel, 15 HP, 4-Speeds.
3—U. S. ELECTRICAL, No. 65, 30" x 4" x 12" Wheel, 20 HP, 4-Speeds.
2—U. S. ELECTRICAL, No. 64, 14" x 3" Wheel, 7½ HP, 4-Speeds.
1—HAMMOND, Model WR-1, 24" x 3" x 12" Wheel, 10 HP.
2—SAFETY RITES, No. 174, 24" x 3" x 12", 10 HP.

GRINDERS—DISC

1—QUEEN CITY, Model 100 Double End Disc Grinder, wheel size 20" x 2" x 2", with 10 HP Motor.
1—U. S. ELECTRICAL TOOL, No. 80. Double End Disc Grinder, Wheel size 16" x 3", with 7½ HP Motor.

HEAT TREAT FURNACE

2—LINDBERG, Model 4860 GH, Gas Fired 48" x 60", Recirculating, with L & N Controls to 1250° F.
1—LOFTUS ENGINEERING CORP. Annealing, Walking Beam Type, Gas Fired, 1600°, Recirculating, 10' x 12' x 40'.
1—AJAX MFG. Electric, ID 54' Long, 46" Wide, 36" High, 800°. Single Phase..

INDUCTION—MELTING HEAT TREAT

1—GENERAL ELECTRIC MG Set, 1250 KW, 1850 HP Motor, 3000 Cycles.
1—LEPEL Spark Gap Converter, 30 KW.

LADLES

3—WHITING Cylindrical, 275 lbs. 19" x 26".
6—MODERN Cylindrical, 1500# 20" x 30".
1—MODERN mixing, 44" x 44", on wheels, 4000 lbs.
2—STEVENS Cylindrical, 2450 lbs. 29½" x 41½".
12—WHITING Lip Pour, 1200 lbs., 23" x 23".
6—MODERN Lip Pour, 1600 lbs. 24" x 24".
4—MODERN FA-9 Pouring Devices and 400# Ladles.
2—WHITING Lip Pour, 2000 lbs., 29" x 29".
3—WHITING Lip Pour, 4000 lbs., 32" x 32".
1—WHITING Lip Pour, 6000 lbs., 36" x 36".
3—WHITING Lip Pour, 5000 lbs., 34" x 34".
1—WHITING Lip Pour, 8000 lbs., 44" x 48".
2—WHITING Lip Pour, 10 ton 62" x 62".
1—WHITING teapot, 4000 lbs., 32" x 32".

MOLDING MACHINES JOLT SQUEEZERS

2—MILWAUKEE No. 123, 12" cyl., stationary.
2—MILWAUKEE No. 104, 10" cyl., portable.
8—OSBORN No. 275 JW, Straddle Type, 10" Cyl., Portable.
16—OSBORN No. 275J, 10" Cyl., Portable.
3—OSBORN No. 276J, 12" Cyl., Portable.
6—OSBORN No. 210 PJ, Swing Back Head, 10" Cyl., Stationary.
6—OSBORN No. 212 PJ, Swing Back Head, 12" Cyl., Stationary.
1—CHAMPION No. JS-10-P, 10" Cyl., Swing Back Head, Portable.
20—SPO No. 110J, 10" Cyl., Portable.

JOLT ROLLOVER PATTERN DRAW

1—DAVENPORT No. 28R, 34" x 48" Table, 12" Draw.
1—DAVENPORT No. 40-SA, 42" x 50" Table, 3000 lbs. Jolt, 18" Draw.
1—DAVENPORT model 24SA, 24" x 30" table, 12" draw, 1200 lbs. capacity.
1—HERMAN #6000 Series, 42" x 78" Table, 6000 lbs. Jolt Cap., 20" Draw.

WRITE FOR OUR COMPLETELY NEW CATALOG OF USED FOUNDRY EQUIPMENT.

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AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

1—HERMAN #1500 Series, Table 26" x 30", Jolt 1500 lbs.
1—MILWAUKEE 217 table 35" x 41", sq. cyl. 16", draw 12", Jolt 1200 lbs.
1—HERMAN #750 Series, Table 20" x 30", 750 lbs. Jolt.
6—INTERNATIONAL "R" Core Rollovers.
1—INTERNATIONAL "G" Size 20" x 8".
1—INTERNATIONAL "G" Size 24" x 10".
1—INTERNATIONAL "G" Size 30" x 12".
1—INTERNATIONAL RES, Size 15" x 8".
1—INTERNATIONAL Type "F," 31" x 54". Draw 16". Jolt Cap. 2500 lbs.
4—JOHNSTON & JENNINGS model 918, 44" x 54" table, 20" draw, 2000 lbs. cap.
1—JOHNSTON & JENNINGS 815-B table 30" x 40", draw 15", jolt 1500 lbs.
1—MILWAUKEE #167, Table 32" x 33", Draw 12". Jolt 1000 lbs., Sq. Cyl. 16".
1—MILWAUKEE Model 60B-3, 60" flask, 18" draw.
10—OSBORN No. 40 and 42, Hand Core Rollovers, 18" x 8" Draw.
1—OSBORN No. 342, Table 23" x 38", Draw 10". Jolt 1000 lbs.
1—OSBORN No. 442, Table 21" x 31", Draw 10". Jolt 600 lbs.
1—OSBORN No. 242W, Table 29" x 42", Draw 19". Jolt 1500 lbs.
2—OSBORN No. 405, Table 57" x 64", Draw 26", Jolt 3000 lbs.
6—OSBORN No. 601, 30" wide Flask, 10" Draw. 750 lbs. Jolt.
6—OSBORN No. 602, 36" Wide Flask, 10" Draw. 750 lbs. Jolt.
2—OSBORN No. 332, Flask Size 26" x 36", Draw 9", Sq. Cyl. 16", 1500 lbs. Jolt.
1—SPO No. 413D. Table 24" x 25", Draw 10". Jolt 600 lbs., Sq. Cyl. 13".
1—SPO No. 507, table 32" x 40", draw 10" to 20", jolt cap. 1500 lbs.
1—SPO model 506, portable, 24" x 30" table, 10" draw, 600 lbs. capacity.
3—TABOR, Size 30" x 40" Table, 12" Draw, 1000 lbs. Jolt Cap. Portable & Stationary.
4—TABOR, Size 22" x 32", and 22" x 42", Draw 10", Jolt 600 lbs.

JOLT PIN LIFT

2—DAVENPORT model 24 AJS, 24" x 30" table, 8" draw, 1000 lbs. capacity.
1—DAVENPORT No. 40 AJS, Table 44" x 54", Jolt 4000 lbs., Draw 18".
1—INTERNATIONAL LP10, 30" x 30" Table.
2—MILWAUKEE No. 620 ND, 24" x 30" Table, 2000 lbs. Jolt.
2—OSBORN No. 559, Table 25" x 30", Draw 6", Jolt 1200 lbs.
1—OSBORN No. 563, Table 55" x 63", Draw 12". Jolt 7000 lbs.
1—SPO model 307, 24" x 30" table, 8" draw, 1000 lbs. capacity. Portable.
1—TABOR, Table 22" x 32", Draw 10", Jolt 600#.

JOLT SQUEEZE PIN LIFT

1—INTERNATIONAL PKL, 12", Squeeze Cyl., 6" Draw.
1—MILWAUKEE 125-3, Table 21" x 27", Jolt 1200 lbs. Draw 8", Sq. Cyl. 12".
1—MILWAUKEE No. 163, Table 15" x 24", Draw, 8", Jolt 1500 lbs., Squeeze Cyl. 16".
1—OSBORN 175J table 18" x 21", draw 5" sq. cyl. 10".
2—OSBORN No. 710J Table 17" x 21", Squeeze Cyl. 10".
1—SPO 2114, table 20" x 27", 4" draw, 600 lbs. jolt, 11" cyl.
1—SPO 2146, table 21" x 31", 6" draw, 14" cylinder, portable.
1—SPO 2136G, table 19" x 26", 6" draw, 13" cyl. portable.
2—INTERNATIONAL PKL Size 14" x 5½"

JOLT (BUMPERS)

1—HERMAN, 40" x 60" Table, 13" Cyl. 6000 lbs. Jolt.
1—MILWAUKEE No. 4050, 40" x 50" Table. 12" Cyl.
1—TABOR. Table 30" x 40". 2800# cap.

MATERIAL HANDLING EQUIPMENT

1—ERIE ¾ yard clamshell bucket, single line.
1—INGERSOLL RAND, Size MHU, Air Winch, 2000 lbs. Cap.
6—LEWIS SHEPPARD Platform Hand Lift Trucks (For Core Room).

CONVEYOR BELTING

700'—HEWITT-ROBBINS 24" wide, 6 ply, 3/16" & 1/8" rubber covered, NEVER USED.
1600'—HEWITT-ROBBINS 30" wide, 5 ply rubber covered, Used.

CONVEYOR BELTS

1—JEFFREY Trough, 20" x 35' centers.
1—JEFFREY Trough, 24" x 103' Centers.
1—JEFFREY Trough, 24" x 145' Centers.
1—JEFFREY Trough 24" x 35' centers.
1—LINK BELT Flat 24" x 40' Centers.

STEEL APRON CONVEYOR

1—JEFFREY 24" x 60' Centers.
1—LINK BELT 36" x 100' centers, motor and drive.
1—LINK BELT 30" wide by 128' Apron Type Sorting Conveyor complete w/motor & Drives

VIBRATING CONVEYOR

1—LINK BELT 36" x 40'.
3—SIMPLICITY Model OA-10-A, 36" x 15'.

PORTABLE TROUGH CONVEYOR

1—FARQUHAR, 18" x 35'.

OSCILLATING CONVEYOR

1—LINK BELT 48" x 154'.

CHAIN CONVEYOR

500' JARVIS No. 678, complete with drives.

UNDER CAR UNLOADER

1—FARQUHAR, 18" x 19'.

TRAMRAIL

3—LOUDEN MONORAIL SYSTEMS, "Super Track"
(1) 110' of 6" I-beam & two 20' bridges
(2) 140' of 6" I-beam & two 12' bridges
(3) 130' of 11" I-beam & two 30' bridges; All Complete.

OVERHEAD CRANES

1—WHITING 5 ton Overhead Crane, 50' span, Cab Operated, AC.

MOLD DRYERS

1—PORBECK Mold Dryer, 42" wide, 8' long, oil fired, Serial No. 242.

MOLD CONVEYOR

1—WEBB 109 Cars, Car Tops 32" x 39".
1—LINK BELT, 98 Cars, Car Tops, 32" & 39".

ROLLER CONVEYOR

150' MATHEWS 36" wide, 3½" rollers, 6" centers, 6" channel, 1¼" shaft dia.
640' MATHEWS 16" wide, 2 9/16" rollers, 4" centers, 4" channel.
40' MATHEWS 18" wide, 2 9/16" rollers, 4" centers, 4" channel.

SAND MULLERS

1—BAKER PERKINS No. 16½, 30 HP motor.
1—CLEARFIELD, #404 Batch, 4 Cu. Ft.
1—CLEARFIELD, #610 Batch, 6 Cu. Ft.
1—SIMPSON, #1 Style B, Single Wheel, 400# Batch.
1—SIMPSON, #3 Style C, Enclosed Gears —3000#.
1—SIMPSON, #2, Style UD, 1500 lbs. Batch, With Loader.
1—SIMPSON, #2, Style C, 1500 lbs., with Loader. Enclosed Gears.
1—SIMPSON #1, style UD, 500 lbs. batch.
1—DRAVO-DOYLE 6 Cubic Feet Capacity Wonder Model, portable, 5 HP 220/440
1—SIMPSON No. 1 Style B, 2 wheel, separate drive, with Aerator, 10 HP motor & Speed Reducer
1—SIMPSON Porto-Muller, 350 Lb Batch, portable

SAND PREPARATORS

6—B & P Screenarators, Models—M & L.
1—PEKAY Aerator, Model 320-3. (For Sand System).
8—ROYERS, Models NDP-C-2, NC-4.
1—SIMPLICITY LB 2'x3', Portable, 3 HP.

SAND CUTTERS

1—AMERICAN, Model BD-Size 75/60.
1—AMERICAN, Model M-Size 99/80.
1—AMERICAN, Model M-Size 89/70.
2—MOULDERS' Friend 50" and 60" brush.

SAND SLINGERS

1—B & P, 19" Tractor Type, 13' Arm.
1—B & P, 16" Tractor Type, 13' Arm, Magnetic Tower, 4' Ramming 4" Tip.
2—B & P, Model 16S-DB Stationary Type, 16" Head.
1—B & P Stationary-Double Belt Model, 5' arm, 4' Ramming, 19" Head, 4" tip. Never Used.
2—B & P Swing Type Slingers, 16" Head 4" Tip, with B & P 2 ton capacity Plate Feeders. (Can be sold Individually)

SHAKEOUTS & SCREENS

4—SIMPLICITY 4' x 6' Model B, 5000#.
1—SIMPLICITY 4' x 10' Model D, 16,000#.
1—ROYER Combination Shakeout & Sand Conditioning unit, Serial #ST-47.
1—HEWITT-ROBINS 36" x 78", Vibrex Screen, Style M-7.
1—LINK BELT 5' x 10' heavy duty.
1—SIMPLICITY 6' x 8' Model DE, 16,000#

TUMBLING BARRELS

2—SLY 42" x 72" Square, 10 HP, Gearhead with Built-in Brake. Timken Bearing.
2—SLY 36" x 84" Type C, 7½ HP, Gearhead Built-in Brake. Timken Bearing.
4—WHITING 48" x 72", 10 HP Gearhead, with Built-in Brake. Timken Bearing.

WHEELABRATORS

1—AMERICAN 86" diameter swing table with dust collector.
1—AMERICAN No. 3 tablast, 4-48" auxiliary tables.
1—AMERICAN No. 1 tablast 7-14" auxiliary tables.
1—AMERICAN 36" x 42" Tumblast with Skip Hoist. Shot return & electrical.
1—AMERICAN 42" x 48" Tumblast, with Skip Hoist. Shot return & electrical.
1—HOLLINGSWORTH Model 44" x 48" Tumblast.
1—HYDRO-BLAST cabinet, 40 HP motor and pump.
1—PANGBORN Shot Blast Room 10' x 12' x 14', with Dust Collector, Elevator.
1—PANGBORN 9LG, 9' Table, 8-24' Tables.
1—AMERICAN 27" x 36" Tumblast with skip hoist, shot return & electrical.

TESTING EQUIPMENT

1—GENERAL ELECTRIC X-Ray, Industrial Type. Model KX10, 140 KW.
1—STEEL CITY Brinell Hardness Tester, Model UK 300, To 3000 Kilograms.

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THE ACME BARGAIN PAGE

AIR COMPRESSORS
Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 Hp, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.
Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. Rebuilt 1952.

AIR HOISTS
6—4000# Ingersoll-Rand, with trolleys.

BLOWERS
Ingersoll-Rand Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.
General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.
Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.

CLEANING EQUIPMENT
Sly 8′ dia. Table Shot Blast Unit.

CORE BLOWERS
3—International SB 12.
4—International SB 13.
10—Osborn 193.
1—Osborn 2035-2.
1—Champion CB 400.
2—CB 10 Late Type.

CORE GRINDERS
5—Milwaukee 70-9.

CORE OVEN VERTICAL HORIZONTAL
1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.
1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min. cycle. Present replacement cost over $90,000.

CORE PASTE OVENS
2—Coleman Gas Fired 28′-25″ x 42″ opening.

CRANES
1—Milwaukee 10 ton 40′ span, 22′ lift, 220 V. A.C.
2—Northern 5 ton 40′ span, 22′ lift, 220 V. A.C.
1—Whiting 5 ton 40′ span, 22′ lift, 220 V. A.C.

GRINDERS
Horizontal Disc (Flat) Grinders:
Gardner #186, 30″ dia. disc. 10 HP, 220/440V, with dresser, wet or dry grinder.
Gardner HV5A, 18″ dia., 7½ HP, 440V, with dresser.
Double End Disc:
2—U.S. 18″ wheels, 2 swing tables.

GRINDERS, SNAGGING
2—Hammond 10 WRI D. E. Snag. 20″ dia. wheels, 10 HP 220/440 v motors, variable speed drives.
1—3″ x 24″ U.S. #65, 20 HP 220/440V.

GRINDERS, SWING FRAME
2—3″ x 24″ x 12″ Fox #4, 15 HP.
1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″ x 24″ x 12″ U.S. 15 HP.

HOT METAL CARRIERS
3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

MOLDING MACHINES
Jolt Squeezers:
5—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine. 18″ x 21″ table.
10—Osborn 275J.

Jolt Squeeze Pin Lifts BIG
2—Milwaukee Jolt Squeeze Strippers, Model 163-50, 15″ x 24″ table 16″ X open end pattern size.
1—Milwaukee 126-3 Jolt Squeeze Pin Stripper, 27″ x 21″ table, 8″ draw. Portable.
2—#165 Milwaukees.

ROLLOVERS
1—Herman 4000# Series 30″ x 60″ table.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
1—Davenport 24 SA Jolt Rollover Pattern Draw. 26″ x 42″ flask size, 12″ draw.
3—Spo Model 9032.
1—Milwaukee 217.
2—International Type G, Portable, 20″ x 8″ draw.
3—Tabor Portable Rollover 30″
Johnson & Jennings 1020-44 x 44 max. Flask Size.

PIN LIFT PUSHOFFS
1—Champion Pin Pushoffs 28″ x 42″ table 10″ draw.

MULLERS AND MIXERS
Simpson #3 Type H open gear type.
Beardsley & Piper #70 Speedmuller, New style cross head.

4 No. 2 Simpson Mullers U D

OVENS, MOLD OR CORE
Despatch Type S, 2 cars 27½ x 54 x 64, Gas Fired.

OVERHEAD TROLLEY CONVEYORS
5000′ Jervis B. Webb & Link Belt 658 chain, 4 D.C. motor drive and MG set.

POURING DEVICES
3—Pouring devices, Whiting 500#.

SAND SLINGERS
B & P Motive Sand Slinger 19″ 2 speed head
B & P Tractor type 13′

SANDBELT CONVEYORS
160′-30″ Trough with Drives.
144′-30″ Flat with Drives.
47′-30″ Trough with Drives.

TUMBLING BARRELS
3—Royersford 42′ x 72′ Roller Bearing, Chain Drive.
1—Sly Square 42 x 42 x64.
1—Sly 42″ Dia. x 56″.

WHEELABRATORS
1—27″ x 36″ Rubber Belt Wheelabrator

STRAIGHTENING PRESS
Hannifin 50 ton hydraulic

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BARGAIN PRICES

GUARANTEED REBUILT EQUIPMENT

AIR COMPRESSORS

1—INGERSOLL RAND 2 stage, Horiz., 50 HP, 200 CFM
1—WORTHINGTON Type "YB", 75 HP, Synchronous, 450 CFM

BLOWERS

1—85 HP G.E. Cupola Blower, 24 oz.
3—7½ HP FISHER, 16 oz.
15—CENTRIFUGAL BLOWERS, 350 CFM to 10,500 CFM.

CLEANING EQUIPMENT

1—AMERICAN #1 MULTITABLE, 6 aux. tables 15", main table 45". SHAKEOUT 4' x 6'.
1—AMERICAN #2 MULTITABLE, 5 tables, 37" dia.
5—US GRINDERS, double end, 10, 15, 20 HP.
4—GRINDERS, Swing frame, 15 HP.
2—TUMBLING BARRELS, Cast Iron, 36" x 24" w/2 HP Motor.
2—TUMBLING BARRELS, Square, 34" x 48".
2—TUMBLING BARRELS, Side Tilt, 18" wide x 20" deep.
1—AMERICAN WHEELABRATOR 36 x 42 Tumblast w/Skip Hoist
1—AMERICAN WHEELABRATOR 42 x 48 Tumblast
1—AMERICAN WHEELABRATOR 48 x 48 Tumblast
1—PANGBORN Rotoblast #14GK2 w/Skip Hoist
1—PANGBORN Rotoblast #28GK2 w/Skip Hoist
1—PANGBORN Tablast, 9' Plain Table, w/Elevator

CONVEYORS

1—LINK BELT Double Deck Oscillating, 80' long x 24" wide, 1954.
1—45' x 24" wide APRON CONVEYOR
4—SAND ELEVATORS, various sizes.
6—SAND BELT CONVEYORS, 10' centers to 140' centers, 18" to 36" belt, complete w/drives and hoppers.
2—CASTING CONVEYORS, wire mesh, 18" x 32" w/drive.

CUPOLAS

2—Whiting #9 w/Blowers & Foxboro Controls
1—WHITING #4 w/Blower & Control
1—MORRIS #9, w/skip, mixing ladle, never used.
1—MODERN, #3, 46' shell, w/blower.
2—MODERN #7; Blowers & Controls.
1—SKIP CHARGER, 3 bottom drop buckets, scale for #9 cupola.

CORE BLOWERS

1—#1 DEMMLER
3—#2 DEMMLERS
1—#55 DEMMLER
1—#3K DEMMLER
1—#3 DEMMLER
1—#SB11 INTERNATIONAL
2—#SB13 INTERNATIONAL
1—#93 OSBORN
1—#193 OSBORN

FLASKS

150—HINES & FREEMAN ALUM. Pop-offs and jackets, send for list.
TRANSITE CORE PLATES, send requirements.

FURNACES—DIRECT ARC MELTING

1—3 Ton LECTROMELT, Top Charge
1—3000#/hr. LECTROMELT.
1—1000#/hr. HEROULT.
1—2000#/hr. HEROULT.
2—3000# HEROULTS.
1—3 Ton HEROULT.
1—6 Ton HEROULT.

FURNACES—INDIRECT ARC

1—350# cap. DETROIT, complete.
1—1000# cap. DETROIT, complete.
1—2000# DETROIT, complete.

FURNACES—INDUCTION MELTING

1—175 KW AJAX, complete.
3—333 KW, AJAX-TAMA-WYATT, 1500# Alum.
2—60 KW AJAX, 60 Cycle, 400#, Alum.
1—7½ KW TOCCO.
1—20 KW AJAX Spark Gap High Freq.
1—3 KW AJAX, Lab. type.
1—30 KW LEPEL.
1—50 KW, G.E., MG Set, 960 cycle.

FURNACES—OIL AND GAS

1—FISHER 4 Burner MNP, 1700#, gas.
4—FISHER, Stationary Holding, 500#, gas.
3—WALKER YORK #400 cruc. tilting, coke fired.
1—SKLENAR 600#, Oil fired.
1—HAUSFELD Tilting, 1200# Mag.
1—R & S Convection Draw, Car bottom, 18' 1 x 8' w x 5' h, oil fired, dismantled, controls.

MOLDING MACHINES

Jolt Rollovers

2—J & J #1020, 50" x 60", 20" draw, 1953.
1—J & J #918, 44 x 54", 18" draw.
1—OSBORN #405, 64 x 50", 18" draw, 3000#.
1—J & J #612, 24" x 30", 12" draw.
2—J & J #815, 30" x 40", 15" draw, 1200# jolt.
1—HERMAN 10,000# Jolt
1—HERMAN, 8' x 12' Table.
2—HERMAN, 1500#, above ground.
2—HERMAN, 20" x 24", 750#.
1—HERMAN, 50" x 72", 6000# jolt.
1—HERMAN, 42" x 78", 6000# jolt.
1—OSBORN, #243, 27" x 40", 20" draw.
4—TABOR, 22" x 42", pattern draw, port.

Bumpers

1—OSBORN #102.
1—HERMAN, 60" x 72".

Jolt Strippers

4—MILWAUKEE #1536, 32" x 38".
4—SPO, 24" x 24".

Jolt Squeeze Strippers

1—OSBORN #175, 21" x 18", portable.
2—MILWAUKEE #163.
1—MILWAUKEE #165, 16" Pin Strip.
1—MILWAUKEE #124-6, 12" Pin Strip.

Jolt Squeezers

2—INTERNATIONAL, 17" x 20", port.
1—OSBORN #212 PJ, 17" x 23", stationary.
4—OSBORN #276-J.
3—OSBORN #275-J.
3—TABOR, 18" x 20", 3" jolt, column.
1—TABOR, 18" x 20", 3" jolt, cantilever.
1—ADAMS, 19" x 20" portable.
2—SPO #213-GP.
1—SPO #110-J.

LADLES & POURING DEVICES

2—WHITING 3 Ton. Bottom pour.
4—10 TON BOTTOM POUR, 55" x 55".
2—45 TON TREADWELL, Excellent.
4—800# Worm Geared, Lip Pour.
3—1500# TEAPOT, Lip Pour, Worm Geared.
3—5 Ton to 9 Ton, Worm Geared, Lip Pour.
1—SWINDELL, Elec. Holding.

MULLERS AND MIXERS

1—SIMPSON #0.
1—SIMPSON #3, enclosed gears.
2—SIMPSON #2, Unit Drive.
2—CLEARFIELD #610 and #920.
1—CLEARFIELD #404
1—B & P #60 Speedmuller
1—B & P SPEEDMULLER, #70.
1—B & P MULBARO, #7, extra Base.

OVENS

1—TOWER CORE OVEN, 14" x 60" trays, 45' high, gas fired, dismantled.
2—ROSS 2 comp., rack, gas, 6½ x 14 x 7.
1—YOUNG BROS. 3 compartment, kiln type electrically heated, with CONTROLS.
1—YOUNG BROS. 3 door, gas, 12' x 8' x 6'-3", recirculating, blower and recorder.
1—COLEMAN, Double Door, Oil, Single Comp., Recirc., 60" wide x 14'6" deep x 80" high.

SAND CUTTERS

4—AMERICAN SAND CUTTERS.
1—MODEL "K", 72" reel, Gas Driven.
1—MODEL "F", 80" reel, Gas Driven.
1—MODEL "D", 76" x 96".
1—SANDMASTER, 70/102, New in 1950. Rubber Tires.

SAND LABORATORY EQUIPMENT

1—Complete SAND LABORATORY
1—TEST CORE BAKING OVEN #606.

SAND PREPARATORS

2—JEFFREY SANDITIONERS, Portable.
2—ROYER SAND BLENDERS, 16" belt.
5—ROYER SAND BLENDERS, 12" belt.
1—LINK BELT REVIVIFIER, Size 5.
1—HETHERINGTON & BERNER SAND DRYER, rotary, oil fired #552.

SAND SLINGERS

1—BEARDSLEY & PIPER MOTIVE JR, 19" head.
1—BEARDSLEY & PIPER TRACTOR TYPE 16" head magnetic separator.
1—PORTABLE SLINGER 16" head, 4' long, on Truck.
1—B & P Stationary, Double Belt, 16" head with 5 Ton Plate Feeder.

TESTING MACHINES

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1—TINIUS OLSEN, BRINELL HARDNESS, 3,000 KG.
1—RIEHLE, UNIVERSAL, 2 screw mechanical, 100,000# capacity.
1—BALDWIN, UNIVERSAL, Hydraulic tensile, 60,000#.

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1—HOUGH PAYLOADER, Model HA, Hydraulic Trip.
2—BELL PRIME MOVERS, 1000# capacity, gas driven.
1—LEWIS SHEPPARD, 4000#, elec. Fork Lift.

MISCELLANEOUS

1—GARDNER VERTICAL DISC GRINDER.
6—PENN DUMP BUCKETS, 1000# to 4 ton.
4—CURTISS AIR HOISTS, barrel type.
1—HOFFCO Vacuum Cleaner, #75.
1—ALLEN-BILLMEYER Vacuum Cleaner, port.

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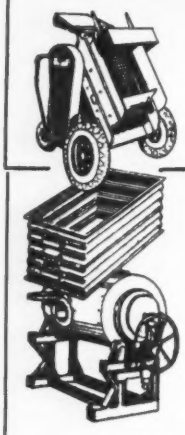

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LARGEST STOCK IN THE COUNTRY

Swindell Electric Furnace, 5′ dia. shell, 350 KVA, 6600 volts.

Swindell Electric Furnace, 4′ dia. shell, 250 KVA, 6600 volts.

Swindell Electric Furnace, 5′ dia. shell, 500 KVA, 6600 volts.

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Ajax Northrup High Frequency Induction Furnace, spark gap type, 35 KVA with 60# and 17# melting pots.

1—Detroit Electric, 1500# capacity, 13,200 primary voltage. Kuhlman transformer. Complete with controls.

Detroit Electric 350#, Type LFA with Kuhlman transformers and oil circuit breaker, 13,200 primary voltage.

Pennsylvania 1500 KVA transformer, 12,000 V. Never used since rebuilt. With complete controls, mostly new, needed for operation of a furnace. New control panel, Field Rheostat, 25 HP, 440 V MG set.

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3—Clearfield, No. 930 Sand Mullers. (1944) 60 HP. MD.
2—Bartlett & Snow, 72″ Roller Type Rotary Sand Screens.
4—Bartlett & Snow, 60″ Roller Type Rotary Sand Screens.
15—Bucket Type Sand Elevators.
Sand Aireators. Sand Storage Bins. Sand Hoppers.

CUPOLAS & EQUIPMENT

4—Whiting, No. 10 Model B Cupolas. 96″ Dia. Shell.
2—Whiting, 12,800 C.F.M. Cupola Blowers. 150 HP. M.D.
2—Whiting Holding Ladles.
10—Bull Ladles.

CHARGING EQUIPMENT

4-Ton, Whiting Electric Monorail Charging Crane. (1944) 35′ Lift.

MOLDING MACHINES

2—Osborn, No. 86-19 Jolt Squeeze Strip Molders. (1950)
6—Milwaukee, No. 244 Car Type Jolt Squeeze Strip Molders.
6—Milwaukee, No. 163 Arm Type Jolt Squeeze Strip Molders.

CORE OVENS

2—Coleman, Horiz. Gas Fired Conveyor Type Core Ovens. (1944) 131′L x 15′3″W x 8′H. Mtd. on steel floor supports
4—Coleman, Gas Fired Continuous Tower Core Ovens. (1944) 10′3″ x 10′3″ x 34′4″ H. Mtd. on steel floor supports
Peters-Dalton, 6-Comp. Rack Type, Gas Fired Core Oven. (1947) 46′8″W x 8′H x 13′6″D.

ANNEALING FURNACES

2—Surface Combustion, Gas Fired Roller Hearth Recirculating Furnaces. (1952) 1250° Max. Temp. 10,500 lb. gross hr. load.

CORE BLOWERS

Osborn, No. 192 (1948)
International, No. SB13 (1945)
Osborn, No. 92, Ser. 8865G.
Demmler, No. 2A, Ser. 1038.

CONVEYORS

2—350′-Bartlett & Snow Mold Car Conveyors. With Flask Carriers.
1200′-Belt Conveyors. 11″ to 36″W.
257′-Slat Conveyors. 19″ to 26″W.
250′-Roller Gravity Conveyors.

AIR COMPRESSORS

2—Ingersoll-Rand, 1871 CFM. 26″ x 16¼″ x 18″ Horiz. 2-Stage. Type PRE-2.355 HP. 4800V.MD. With controls.
Ingersoll-Rand, 25″ x 15¾″ x 18″ Horiz. 2-Stage. Type PRE-2. 324 HP.MD. With controls.

MISC. EQUIPT.

13—Robins & Simplicity Shakeouts.
2—Shepard-Niles, 3-Ton, Elec. Monorail Hoist Units.
7—International 14″ x 8″ Hand Rollover & Draw Machines.
1000—Sets, Asst. Flasks.
26—Ingersoll-Rand Pneum. Hoists.

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Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

PENTON BUILDING • CLEVELAND 13, OHIO

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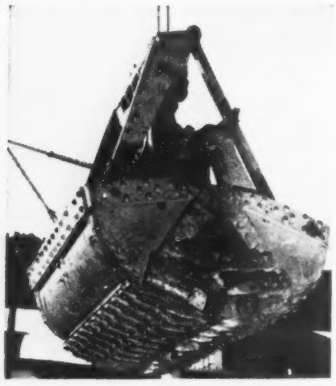
DUAL-PURPOSE FOUNDRY BUCKET
Cuts Coke and Sand Handling Costs



HANDLES COKE WITH MINIMUM DEGRADATION

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HANDLES SAND WITH MINIMUM LEAKAGE

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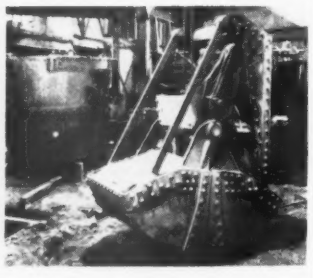

For average headroom, there's a size and type of Blaw-Knox Foundry Bucket to meet a wide range of conditions. Write for Bulletin 2232 for details.

BLAW-KNOX COMPANY
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Pittsburgh 38, Pa.
Offices in Principal Cities

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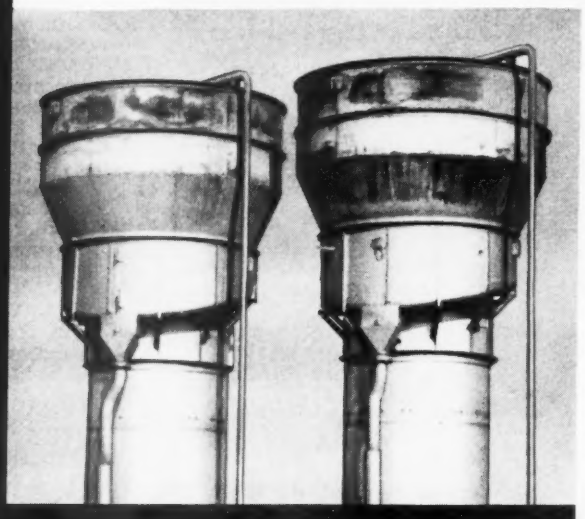
FOUNDRY BUCKETS

BLAW-KNOX

THE MOST COMPLETE RANGE OF SIZES AND WEIGHTS

SCHNEIBLE

YOU CAN BE SURE YOUR CUPOLA EMISSIONS ARE CONTROLLED WHEN YOU USE A SCHNEIBLE "SW" COLLECTOR



Selection of your cupola collector is becoming more and more important. The enactment each year of municipal codes that restrict cupola emissions to certain definitive limits prove this. Schneible's "SW" Type, America's most popular wet method cupola collector, you can buy with complete confidence.

Schneible Cupola Collectors are designed for simplicity and efficiency of operation. They are practically maintenance-free, with no moving parts, no nozzles to clog, nothing to freeze in the coldest weather.

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WHAT DO YOU WANT IN A RIDDLE?

LOW OPERATING COST?
LOW INITIAL COST?
SMOOTHER OPERATION?
LESS MAINTENANCE?
FASTER SCREENING?

COMBS HAS THEM ALL!

WORLD FAMOUS!

TYPE "V"

Screens sand Fine, Coarse, Medium. 20″ dia. sieve with special clamp for 5-second changes. Does work of 10 men. Fully-enclosed 1/6 h.p. motor. 4′6″ high, weight 100 lbs. 20″ Sieve: $275.00. Giant V-5, 36″ Sieve: $495.00.

TYPE "CR"

24″ dia. round sieve. Thoroughly sifts, mixes, fluffs, aerates the sand. 1/3 H.P. enclosed motor. Height 4′6″, weight 250 lbs. Complete: $350.00.

TYPE "CS"

24″ square sieve. Continuous operation, no dumping. Refuse tails off to one side. Height 4′ 10″, weight 295 lbs. With 1/3 h.p. enclosed motor. Complete: $360.00.

TYPE "HL"

Laboratory model . . specially designed for sand control. Fitted with 1/6 H.P. motor. Price, complete less sieves: $250.00.

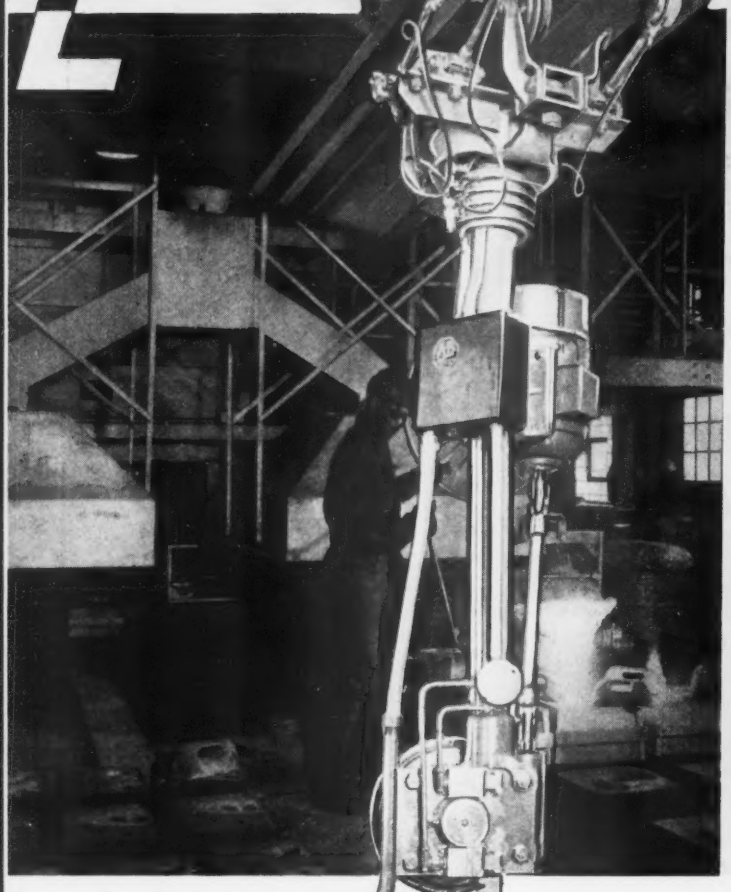
PROMPT DELIVERY FROM YOUR FOUNDRY SUPPLY HOUSE

GREAT WESTERN MFG. CO.

LEAVENWORTH • KANSAS

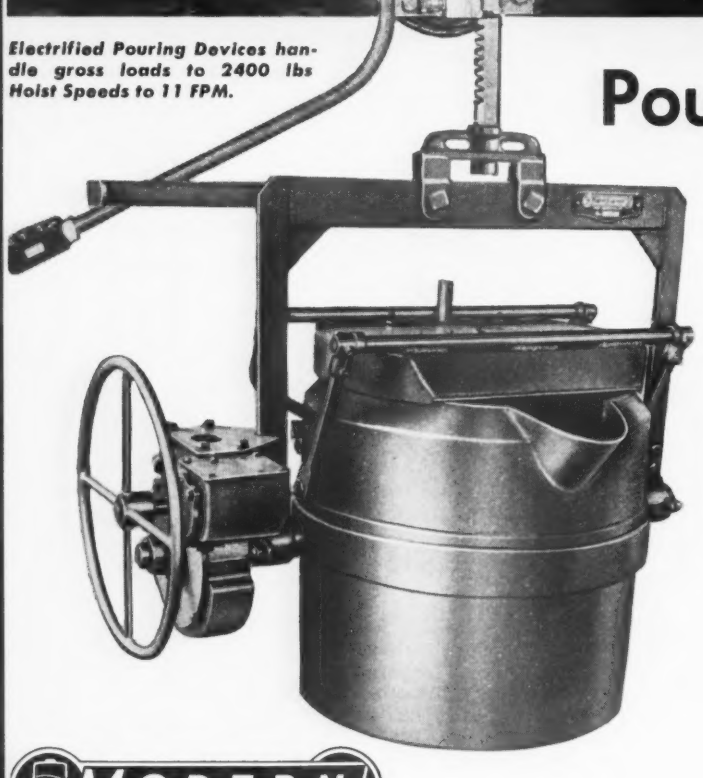
For more information, use Reader Service Card, page 229

Electrified...



Monorail, cab controlled, elect carrier with ladle of 6000 lb capacity.

Electrified Pouring Devices handle gross loads to 2400 lbs Hoist Speeds to 11 FPM.



Pouring and Distribution.

Ever since making the first, mechanical POURING DEVICE numerous patented improvements have been added to cut pouring costs while boosting foundry tonnages. And now with ELECTRIFIED drives for lift, traverse and pouring more castings flow by push button:

- Back-breaking work is eliminated...
- End-of-heat fatigue is minimized...
- Fewer loss-time accidents reduce insurance rates...
- Less metal is pigged...
- Waste due to chilling is nil...
- Over-all quality of metal is high

All MODERN pouring and distribution systems are engineered to the need. Whether the job calls for a basic, standard design or a MODERNIZED, high-speed, cab-controlled, carrying system as illustrated you will want a copy of catalog P-152-A—the latest, MODERN catalog on ENGINEERED POURING SYSTEMS . . .

MODERN

MODERN EQUIPMENT CO., Dept. F-11, Port Washington, Wis.

Send catalog P-152-A on ladles and pouring ☐
Catalog #150 on cranes, monorail, trolleys, switches ☐
Catalog 147-A on cupolas, chargers, hot blast, dust control ☐

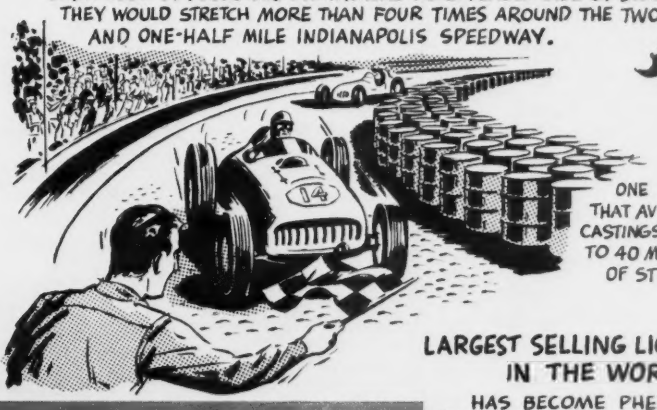
Company .....
Street ..... Zone ..... Box .....
City ..... State .....
My Name .....

"Facing" Facts

FROM STEVENS FACING DEPARTMENT

FOUR TIMES AROUND THE INDIANAPOLIS SPEEDWAY

IF DRUMS OF STEVENS LIQUID PARTING THAT HAVE BEEN USED BY FOUNDRIES EVERYWHERE WERE PLACED SIDE-BY-SIDE THEY WOULD STRETCH MORE THAN FOUR TIMES AROUND THE TWO AND ONE-HALF MILE INDIANAPOLIS SPEEDWAY.



NO DUST FOR MOLDERS TO BREATHE

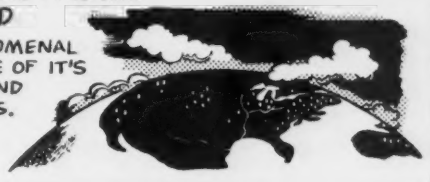
MOLDERS USING STEVENS LIQUID PARTING SAVE TIME IN DUSTING DRY PARTING ON EVERY MOLD. IT ELIMINATES THE DUSTY AIR AROUND MOLDERS... KEEPS BREATHING ZONE CLEAN AND FRESH.

GET 40 MOLDS FROM ONE APPLICATION

ONE LARGE MIDWEST FOUNDRY THAT AVERAGES 1,200 TONS OF CASTINGS PER MONTH REPORTS UP TO 40 MOLDS FROM ONE APPLICATION OF STEVENS LIQUID PARTING.

LARGEST SELLING LIQUID PARTING IN THE WORLD

HAS BECOME PHENOMENAL "BEST-SELLER" BECAUSE OF IT'S GREAT ECONOMY AND MANY VARIED USES.



FOR ECONOMY YOU CAN'T BEAT . . STEVENS LIQUID PARTING

In the Stevens files we have many testimonials from foundries which state they have made up to 60 molds from a single application of Stevens Liquid Parting. We have hundreds of reports of 25 to 50 molds for a single application. That's positive proof of its economy. And it is one of the important reasons why Stevens Liquid Parting is the largest selling liquid parting in the world today.

Consider these additional features: Patterns are left clean, with no adhering sand . . . Molds always give smooth castings because sand separates cleanly . . . Molders save time and increase production since, unlike dry partings, it is not necessary to shake parting on the pattern for each mold . . . It eliminates any need for heating patterns or plates . . . There is no parting dust in the molder's breathing zone.

If you have never tried this great foundry item be sure to make an early test in your own plant soon. Call your Stevens Sales Representative or write direct to Frederic B. Stevens, Inc., Detroit 16, Michigan.

WHAT USERS SAY:

WE TRIED MANY OTHER BRANDS

"After trying several other liquid partings, we tried the Stevens product and must admit its superiority to all others."

NO STICKING IN CORE BOXES

"Since using Stevens Liquid Parting there is no sticking in the core boxes, and they have taken on a 'burnished' appearance. Results are very satisfactory."

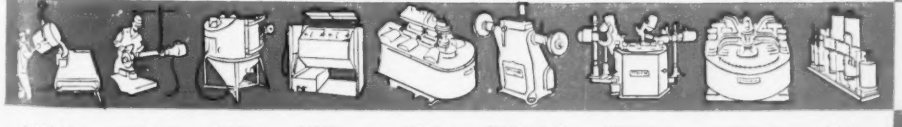
SOLVED OUR DIFFICULT CASTING JOB

"Stevens Liquid Parting enabled us to solve a difficult casting job of fins for an air cooled internal combustion engine."

COST IS NEGLIGIBLE

"The cost of Stevens Liquid Parting is negligible. On 625 tons of castings our parting costs were $60.00 or about 10c per ton of casting."

BRANCHES: BUFFALO • CLEVELAND • INDIANAPOLIS • NEW HAVEN



FOUNDRY FACINGS | GRINDING OPERATIONS | BLAST FINISHING | BARREL TUMBLING | METAL CLEANING | POLISHING & BUFFING | AUTOMATIC FINISHING | AUTOMATIC PLATING | METAL RECLAMATION

Metal Finishing equipment and supplies from castings or stampings to finished product

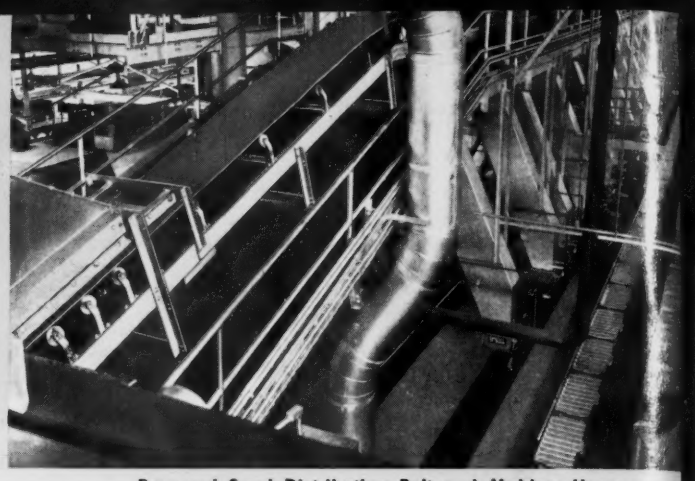
FREDERIC B. STEVENS

INCORPORATED

EVERYTHING FOR A FOUNDRY

DETROIT 16, MICHIGAN

Molding Line and Mold Conveyor in Jobbing Foundry



Prepared Sand Distributing Belt and Molders Hoppers

Complete Facilities

engineered, built and installed to meet your individual requirements

● Designed by foundry specialists who are familiar with the most advanced techniques in our fast changing industry, tailor made to meet your particular kind and type of work, Bartlett-Snow's complete sand, mold and castings handling systems *cut costs* and *increase output.* You fix definite responsibility for both *production* — and *performance* of your installation — by letting Bartlett-Snow engineers handle the entire project as a unit. We have been privileged to serve many of the country's best known and lowest cost foundries. May we help you too?

Core Sand Preparation System

Mold Conveyor Handling Large Wor

DESIGNERS

ENGINEERS

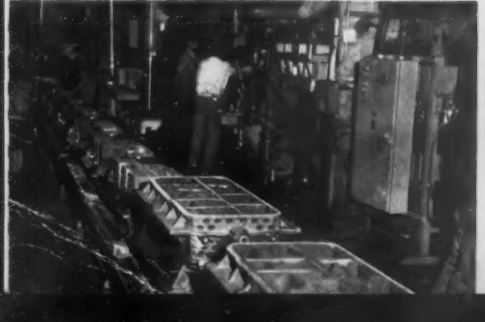
BARTLETT-SNOW
CLEVELAND 5, OHIO

FABRICATORS

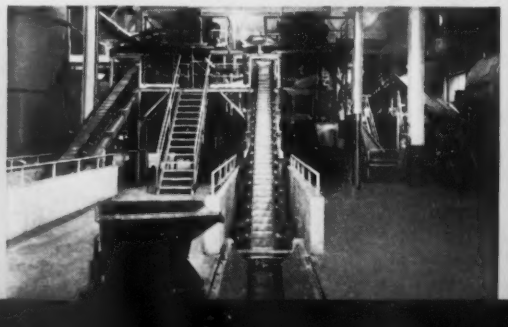
ERECTORS

Foundrymen Who Know — Buy Bartlett-Snow

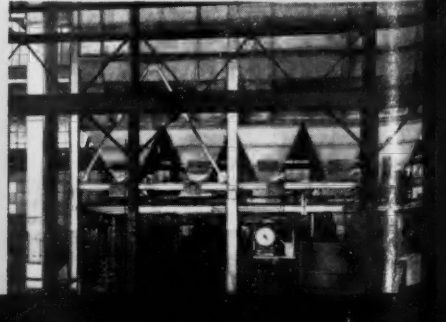
Mold Conveyor in Large Automotive Foundry



Inclined Apron Conveyors Handling Small Castings



Sand Preparation System Showing Storag



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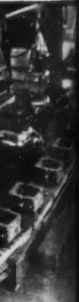

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g Storag